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The American Association of Genito-Urinary Surgeons

First Day, May 31, 1909

SOME CASES OF URETHRAL CALCULI

By JAMES R. HAYDEN, M. D., of New York.

MY object in reporting the following cases of "urethral calculi" or concretions, is with the hope that they may shed some additional light on the etiology of these rather infrequent foreign bodies.

CASE 1. Thos. McB., 38. Admitted to Bellevue Hospital August 27, 1908 for painful and difficult urination.

Patient has never had urethritis. Eight months ago had a very severe attack of left renal colic, which has recurred at intervals. Two and a half months ago had last attack of colic, during which he felt something coming down from the left kidney to the bladder, and one week later and without pain he passed a small stone by the urethra: this was lost.

Examination. The urine is clear and contains flakes. No stricture detected. A bougie à boule touches a rough body in the bulbous portion of the canal, which can also be felt on palpation.

Treatment. External urethrotomy was performed in the usual manner and a 15 grain stone (see Plate I, Fig 1), removed from the bulb. The bladded was drained with a large soft rubber perineal tube for 24 hours, the patient making a prompt recovery.

This stone probably formed in the left kidney and on its outward course became engaged in the bulbous urethra where it remained until its removal.

An X-Ray of the urinary tract was negative.

CASE 2. Thos. F., 45. Admitted to Bellevue Hospital December 14, 1908, for frequent, painful and difficult urination.

Patient had urethritis thirty years ago. Has had frequent attacks of complete urinary retention, relieved by catheter, and at present his stricture is being dilated with bougies. No history of renal colic.

Examination. The urine is very turbid from pus, and neutral in reaction. Four inches from the meatus is a stricture admitting a No. 24 F. endoscopic tube, projecting into which can be seen the end of a conical stone, which can be readily felt from without.

Treatment. External urethrotomy having been performed and the stricture cut, a 49 grain stone (see Fig. 2), was removed, and the bladder drained for 24 hours. Recovery prompt.

This stone probably formed behind the stricture, where it increased in size.

CASE 3. H. H., 45. Admitted to Bellevue Hospital December 11, 1908, for painful and difficult urination. No history of renal colic. Urethritis twenty-seven years ago, which patient says has never been cured. Eighteen, and again fifteen years ago internal and external urethrotomy were performed for the relief of strictures. Five years ago litholapaxy was performed *without an anæsthetic* and since that time patient has had painful, frequent and difficult urination, the stream stopping suddenly and temporarily at times.

Examination. The urine is cloudy and contains tissue elements. A No. 22 F. endoscope shows a stone in the bulbous portion of the canal, beyond which is a tight stricture.

Treatment. A stone weighing 26 grains (see Fig. 3), was removed through an external urethrotomy incision, the stricture cut and the bladder drained for 24 hours. Recovery satisfactory.

In this case a fragment of stone was left in the bladder

PLATE I.—Presented by Dr. J. R. Hayden.

Fig. 1.

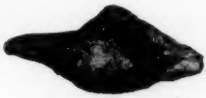


Fig. 2.

Fig. 3.

Fig. 4.

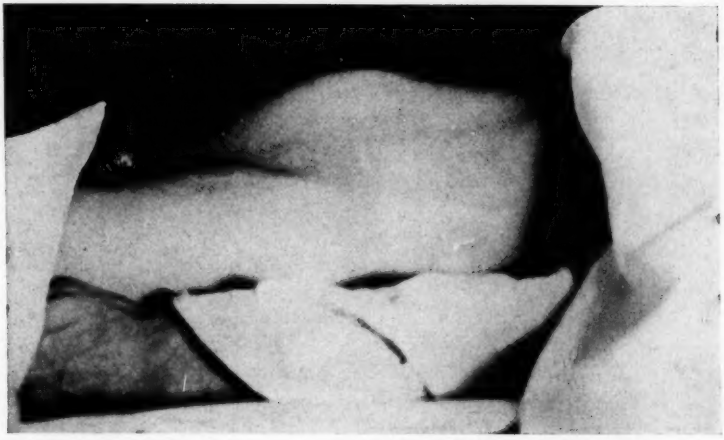


Fig. 5.

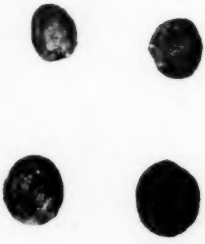


Fig. 6.

Fig. 7.

after litholapaxy and passing into the urethra lodged behind the stricture.

CASE 4. Ed. O'C., 63. Admitted to Bellevue Hospital November 3, 1907, for very difficult and painful urination.

Patient has never had renal colic. Fifty years ago he had a very severe attack of urethritis, which lasted for two years. Eighteen years ago had acute retention of urine which was relieved by suprapubic aspiration. Two years ago began to have severe pain in the bladder, which was increased by motion, and at times has had complete stoppage of the stream.

Examination. The urine is very foul, alkaline and ammoniacal. Two inches from the meatus is a stricture, admitting a No. 14 F. bougie à boule, and a second filiform stricture at the bulbomembranous junction, behind which the filiform grates upon a rough body, which can be palpated from the perineum.

Treatment. A stone weighing 11 grains (see Fig. 4), was removed through an external urethrotomy wound, the strictures cut, and the bladder drained for 48 hours. Recovery was uneventful.

In this instance the stone had its origin behind the stricture and remained there unnoticed until patient's admission to hospital.

CASE 5. W. G. C., 63. Admitted to Bellevue Hospital December 30, 1904, for retention of urine.

Patient gives no history of urethritis, or renal colic. Six weeks before admission patient began to have frequent, painful and difficult urination, and for the last three days all of the urine has been drawn by catheter.

Examination. The bladder is markedly distended (see Fig. 5). Temperature 101° F. Pulse and respiration normal. A bougie à boule touches a hard body just beyond the navicular fossa and on palpation four hard bodies could be felt in the pendulous urethra.

Treatment. The urethra was anæsthetized as completely as possible with 2% alpyin solution, and warm sterile oil injected, after which the four stones (see Fig. 6), were removed by means of a urethral scoop and manipulations from without, the

distal portion of the canal being compressed to prevent the calculi from slipping back. A full size catheter was then passed to the bladder from which was drawn 53 ounces of foul urine. The bladder was irrigated with boric acid solution, one pint of which was left in to prevent collapse of the distended and congested walls. All of the urine was drawn by catheter until the urethral abrasions healed, the patient taking plenty of bland water and urotropin and the canal being irrigated with mild astringent solutions. Recovery was uneventful.

In this case the origin of the calculi cannot be positively stated.

The X-Ray was negative.

CASE VI. A. V., 50. Admitted to Bellevue Hospital February 4, 1909, for retention of urine.

No history of urethritis. Has had several attacks of renal colic during the last two years. Twenty-four hours before admission patient had a very severe attack of left renal colic, which was followed by agonizing pain in the perineum and very difficult urination which resulted in complete retention a few hours before his admission.

Examination. The bladder is moderately distended. A 25 F. sound detects a rough body in the prostatic urethra, where it was too firmly held to be pushed back into the bladder.

Treatment. Through an external urethrotomy incision two stones weighing 17 grains (see Fig. 7), were removed from the prostatic urethra with great difficulty, as they were firmly grasped by the walls of the canal. The bladder was drained in the usual manner. Recovery was prompt and satisfactory. X-Ray plates were negative.

This stone was undoubtedly renal in origin, and grasped by the prostatic musculature during the patient's efforts to void his urine.

Urethral forceps were not employed in any of the above cases, as in my experience calculi and rough foreign bodies extracted from the deeper portions of the urethra in this manner are liable to lacerate the urethral walls to a considerable degree,

whereas a simple external urethrotomy incision allows inspection of the foreign body, plenty of room for its delivery, and being longitudinal, heals promptly without stricture formation, provided the wound is dressed daily by the surgeon himself, and the urine rendered sweet and copious by plenty of water and urotropin.

If the calculus is situated in the *pendulous* urethra, it can then be removed with forceps or scoop, aided by manipulations from without, or if the concretion is small, the forceps can be worked through an endoscopic tube, the operative field being brilliantly illuminated.

The conclusions to be drawn from the above cited cases are:

First. The importance of freeing the bladder of all fragments of stone after cutting or crushing operations, to prove which a cystoscopic examination should be made after litholapaxy, and every portion of the bladder mucous membrane examined with the bare finger after cystotomy.

Second. Always examine the canal for concretions behind strictures, but especially in old and tight ones, and those complicated by fistulous tracts.

Third. During and after an attack of renal colic all of the urine should be saved and examined for sand or concretions, and if neither are found, the urinary organs should be subjected to the "X-Ray" or instrumental examination.

Fourth. Litholapaxy, especially for large stones, can be performed in a more thorough manner when the patient has general anæsthesia, and the surgeon does not hurry to spare his patient the pain of a proper post-operative examination.

VESICAL CALCULUS, REMOVED BY REPEATED CRUSHING (TWO CASES)

By G. K. SWINBURNE, M. D., of New York.

I SIMPLY have two specimens to show that I thought might prove of interest because of the manner in which the litholapaxy was done, both of these cases being done under local anæsthesia. The two larger bottles are from one case, and the eleven smaller ones are from the second.

The first case was a man fifty-nine years of age, who nine years before had a nephrotomy for stone in the kidney. His recent trouble began about a month before he appeared at the dispensary. By the cystoscope it proved to be an oxalate stone, and I thought it might be easily removed by the lithotrite and by local anæsthesia, or even without anæsthesia. The patient was rather nervous after the operation began, and I stopped as soon as I felt that I had done enough. I thought I was going to get it all out, but, as you can see, there was one fragment left behind which was removed a week later. The patient felt immediate relief from his symptoms after the first operation, and was so pleased that he submitted to the second operation for the removal of the balance without any difficulty. He was cystoscoped two weeks later. After litholapaxy I generally wait two weeks, unless I feel that the case will stand it earlier. Nothing was found. The bladder was perfectly clear. That man has had no symptoms since. He comes to the dispensary occasionally to see me. That stone was very easily removed. It came into the jaws of the lithotrite without any difficulty at all. It could have been removed at one sitting if I had tried.

The other case was a little different. The man was sixty-five years old, and gave no previous history. For a year and a half he had had his symptoms. He had suffered with great frequency and pain, but he refused to go into the hospital for operation. So I thought I would try to see what could be done with

litholapaxy at the dispensary. He had a little residual urine, and in trying to get the stone with the lithotrite the stone would not go ino the jaws at all. I had to turn the beak to find the stone and then open the jaws, close on the stone, turn back, and crush. The result was that these manipulations were a little more painful than where you simply open the jaws and have the stone slide in. For that reason, the first two or three times I simply caught the stone and cracked it and washed out what I had broken up. These operations were done at intervals of a week apart, and sometimes I would cystoscope him to see how large the stone was, and it seemed as if it was always about the same size. I wondered at that time whether the reason the stone did not come into the instrument was that the stone was in a diverticulum and that we were catching simply a projection from the diverticulum. But the cystoscope did not seem to reveal any such condition, and after a while, after these repeated operations, I came to know just where the stone was going to lie and could catch it very easily. I would simply catch the stone, give it one crack, take out the instrument, wash out, and after a while I removed all the stone. The patient has been completely relieved. In fact, after half the stone was removed he felt very much better. He did not mind the insertion of the lithotrite at all after the first two or three weeks. He had no reaction whatever. His urine cleared after the stone was completely removed. From time to time he has a clouding up of his urine, and I intend to have him X-rayed, because I have a feeling there is a stone in some other part of the urinary tract. I thought that it was possibly a case of prostatic obstruction, but since the removal of the stone he has only about a half a drachm of residual urine.

DISCUSSION

DR. FRANCIS S. WATSON of Boston: Just a word with regard to the application of the word "litholapaxy" by the old fashioned lithotrity repeated crushings, as Dr. Swinburne has used it. I cannot quite let it pass without comment. The word Litholopaxy being that which was coined by Bigelow and applied by him to the crushing and removing of

the whole calculus at one and the same sitting, it is a misnomer to apply it as Dr. Swinburne has done to Lithotrity in two or more sittings.

Dr. Francis R. Hagner of Washington: I had a case some years ago I think in one of the youngest patients I ever heard of having a urethral stone, namely, in a child three days old. It caught in the meatus and was very readily removed.

I have been unfortunate enough to have a urethral stone form around a suture left at the time of a prostatectomy. I used to put traction sutures in the urethra so that if the perineal tube had to be taken out the assistant could take hold of these traction sutures and replace it easily. In some way in one case one of these sutures was pushed up into the urethra with the dressings. The patient got along all right for a year. Then he began to have frequency of urination, and examination showed a urethral stone. I took the stone out, and found that the center of it was a silk suture. Since then I have only used catgut for this purpose, and have had no further trouble.

Dr. H. A. Fowler of Washington. I am very much interested in the specimens presented by Dr. Hayden. I think there can be no doubt that in the majority of these cases the calculus in the urethra is secondary, but occasionally one meets with a case in which the history and the symptoms point to a primary development within the urethra. One such case I had under observation two years ago, and presented to this Association a paper on that subject. Photographs of that calculus are in the Transactions of last year. That is one of the largest specimens, I believe, that has been recorded. In that case the calculus was primary in the urethra. The patient was a young man about thirty. He had met with an accident ten years previous to the time when he came under my observation. At that time he had fallen down a shaft some ninety-five feet and had sustained an injury of the pelvis. He was immediately taken to the hospital, and was unable to void. A perineal section was performed, and after leaving the hospital he was free from genito-urinary symptoms for a year. At about this time, a year after the operation, he began to have symptoms indicating stone. Repeated examinations, however, failed to disclose any stone of the urethra or bladder, and he was treated by sounds and irrigations without clearing up any of the symptoms. He then returned to his home in Virginia, where he remained for the next nine years, suffering with frequency and great tenesmus. At the end of this time, when he came under observation we found a large mass in the bulbous urethra which examination showed to be a large calculus. This was

removed by a perineal section, and the photograph of the stone shows a very large, irregular stone, which was entirely urethral, and the interesting point about this specimen is that the upper surface of the stone shows a distinct groove made by the external sphincter. The vesical end of the stone is very irregular, but did not extend into the bladder. On section, the nucleus of this calculus is found to lie in the same plane with this groove formed by the external sphincter. In other words, the calculus developed in the membranous urethra, and its further growth took place both toward the meatus and back toward the bladder. The examination of the specimen, the history of the case, all indicated that we were dealing with a primary urethral calculus, which I think is very rare.

In regard to Dr. Swinburne's experience in these two cases, I might say that I have never found any difficulty in doing a rapid crushing operation under local anæsthesia, provided that after the crushing the fragments are immediately washed out. The patient is then left for an interval of a week or ten days, the lithotrite again introduced and further crushing done. In no case have I had to crush more than twice, and during the interval between the first and second crushings the patient has been quite free from any irritation that might be attributed to fragments still remaining in the bladder. I quite agree with Dr. Swinburne as to the importance of controlling the results in these cases by cystoscopic examination. In the last cases that I have had it has been possible after the second crushing immediately to introduce the cystoscope and to be assured that no other fragments remained in the bladder. This, by the way, illustrates the fact that in these operations, carefully done under local anæsthesia, it is possible to perform a cystoscopy immediately following, which indicates that there was very little trauma and practically no bleeding.

Dr. E. Wood Ruggles of Rochester, N. Y. I am very interested in the cases of urethral calculus reported by Dr. Hayden. About a year ago a patient presented himself with no symptoms except increasing difficulty in urination which occasionally amounted to absolute retention. The attending physician had been able to relieve the attacks of retention by means of a soft rubber catheter. Finally, however, the catheter doubled on itself, and he sent him to me for examination. I found a hard mass exactly in the middle of the prostate. The next day this was not to be found, having evidently moved farther along the urethra to just behind the cut-off muscle. I was able to dislodge the stone enough to draw his urine with a very small metal catheter and felt a click against it in using this catheter. I was able to see it plainly by means of a straight Koch

urethroscope, but its calibre exceeded that of the largest tube so greatly that it was impossible to grasp it and it was too hard to break up and remove piecemeal. I did a perineal section, and found the stone very hard to grasp, but by introducing my finger into the rectum and pressing downward upon it it was then very easy. The stone was considerably larger than a pea.

Dr. C. L. Gibson of New York: Dr. Hayden's paper reminds me of a mishap that I had many years ago in exploring the urethra. A small boy was brought in, and I passed a small metal bougie à boule to confirm the diagnosis of urethral calculus. To my horror when I came to withdraw the instrument it would not come out. The calculus had been dislodged, allowed the instrument to pass, and become impacted on top of it. So there was a calculus and the bougie à boule both firmly fastened in the urethra. I did a perineal section and drew the bougie à boule out through the perineal wound.

Dr. Swinburne. In regard to the word "litholapaxy," I studiously avoided putting it in the title because I doubted whether it described this procedure. At the same time, of course, in speaking ex tempore it slipped out. But after thinking it over, does litholapaxy necessarily mean the complete removal of a stone in one sitting? Certainly the operation is rapid enough, very little time is taken, and there is only one insertion of the lithotrite.

In regard to the fragments in these cases, where any large mass of stone is left, you cannot remove oftentimes the small fragments, because they will often remain behind the other fragment in the bladder, or, at least, they do not seem to come out as they do when the stone has been so crushed that all fragments can come through the evacuator, because in all of my cases where I have left a fragment in the bladder, one or two fragments will come out one or two days after the operation. In fact, in that specimen that I showed there was one piece that was large enough to come to the meatus, and which the patient had pried out from the meatus with a hair pin. From being a very nervous man he got so he didn't mind the insertion of the lithotrite at all.

FACTS REGARDING THE RELATION OF TUBERCULOSIS OF THE KIDNEY TO TUBERCULOSIS OF THE LUNGS

(A PRELIMINARY REPORT OF AUTOPSIES, CLINICAL EXAMINATIONS AND EXPERIMENTAL WORK)

By DR. JOHN H. CUNNINGHAM, JR., of Boston.

THE object of this paper is to record certain facts in regard to the relation of tuberculosis of the kidneys to tuberculosis of the lungs. This work has been done without a perusal of the literature, and if similar data exist, they will be included in connection with future work.

This paper is divded into three parts.

Part 1. The percentage and character of tubercular kidney infections recorded post-mortem in which tuberculosis of the lungs has been demonstrated.

Part 2. The analysis of the urine from patients with advanced tuberculosis of the lungs to determine the frequency of associated tubercular kidney infections.

Part 3. Experimental work to obtain data in regard to whether or not the tubercle bacillus is eliminated from the general circulation by the kidneys, without producing tuberculosis of the kidney.

Part 1. The percentage and character of tubercular kidney infections recorded post-mortem in which tuberculosis of the lungs has been demonstrated.

It is, I believe, generally admitted that tuberculosis of the kidney is hæmatogenous in origin. The tubercular infection of the kidney is certainly, in the great majority of cases, secondary to a tubercular process elsewhere, the infection taking place through the circulatory system by the lodging of the tubercle bacillus or minute emboli carrying the bacillus, in the terminal arterial blood vessels of the kidney.

Admitting tuberculosis of the lungs to be the most common

site of tubercular disease in the body, the autopsy records at the Boston City Hospital and the Long Island Hospital, catalogued as "Tuberculosis of the Lungs," were examined to determine the frequency of the presence of kidney tuberculosis. The tubercular processes in the lungs as recorded in these autopsy records, varied from small healed foci to the most advanced destructive tubercular lesions, and there were also instances of miliary tuberculosis.

The total number of cases of tuberculosis of the lungs from which this analysis has been made was eight hundred and twenty-five.

The kidney was found infected with tuberculosis in seventy of this number, or 8%.

Of these seventy cases, the disease was unilateral in eleven, or 15 5-7%. The left kidney four times, and the right kidney seven times. The lesions were caseous in all.

Both kidneys were found to be infected in fifty-nine instances, 84 2-7%.

Of these fifty-nine bilateral cases, forty-six were miliary infections, 77 57-59%, and thirteen were caseous tuberculosis, 22 2-59%.

Of the whole number of cases of kidney infection, the bladder was involved in fourteen, or 20%.

There was no instance of tuberculosis of the ureter associated with tuberculosis of the kidney, in which the bladder was not also infected.

There were ten instances of associated kidney ureter and bladder tuberculosis.

There were two instances of tuberculosis of the bladder without infection of the kidney or ureter, both instances being infection of the bladder from continuity with a tubercular focus of the genital organs, one in a female in which there was tuberculosis of the Fallopian tube, and the other from tuberculosis of the prostate and seminal vesicles.

There were three cases of tuberculosis of the adrenal gland without tuberculosis of the kidney. In two instances, it appeared

as a bilateral infection, miliary in character. In the third, it was unilateral and caseous in character.

There were four cases of tuberculosis of the adrenal and kidney. Three were bilateral and miliary in character, both in the adrenal and kidney. One was unilateral, caseous in character, the processes in the two structures being continuous.

There were five cases of acute miliary infection of the liver and spleen, in three instances including the intestines also, without any tubercles in the kidneys.

Walsh (*Trans. Nat. Asso. for Study and Prevention of Tuberculosis*, 1906) has called attention to the frequency of the presence of different forms of nephritis, associated with tuberculosis of the lungs, and in a careful study of microscopic specimens of the kidneys from autopsies performed upon patients with tuberculosis of the lungs, he has noted localized areas, usually situated under the kidney investment, but also scattered through the cortex and extending for a distance of from 1 to 4 mm. toward the pyramids. He has raised the question of whether or not these fibrous areas may not be small healed tubercular infarcts.

With this in mind, the records of the microscopic condition of the kidneys as found at autopsy were examined to determine whether or not there was any constant condition, macroscopic or microscopic, which might be attributed to the tubercular process in the lung, it being most probable that a focus of this disease must at least contribute some toxic material which accounts for the influence of the disease upon the general metabolism, and which product, or the deleterious effects of which product must be eliminated in part at least by the kidneys. It was hoped also that there might be some microscopic evidence of healed tuberculosis in the kidney, but there was nothing noted other than the frequent appearance of foci of fibrous overgrowth as mentioned by Walsh. These areas consisted of foci of fibrous tissue, usually in association with the terminal vessels, and showed a varying degree of lymphoid infiltration. The issuing tubules were dilated, often containing granular material. The cell-borders of the tubules were indistinct, and the brush edge usually absent.

The epithelium of the tubules was granular and occasionally vacuolated.

The following table which records the condition of the kidneys found in the autopsy records of the cases at the Boston City Hospital shows that almost every known condition of the kidney disease was observed, and there was nothing which might be considered the effect of an unknown toxine, the result of tuberculosis in the lung; nor was there any evidence other than the condition above mentioned which might be considered to be a healed tubercular process in the kidney. If the tubercle bacillus is in circulation, is it not strange that it does not assert itself in instances of kidney disease, with the impairment of the vitality of the organ dependent upon the pathological changes present in it?

Abnormalities. Double ureter on right. Kidney normal.

Abnormal kidney situated over sacro-iliac synchondrosis.

Absent right kidney. Tuberculosis of left kidney.

Abnormal small kidney converted into cyst. Very small ureter occluded.

Double ureters. Double hilum. Bilateral. Kidney tissue shows chronic diffuse nephritis.

Both kidneys show multiple areas of fibromata and multiple caseous tubercular foci as well.

Congenital cystic degeneration of right kidney. Compensatory hypertrophy of left kidney which shows fatty degeneration.

Congenital abnormality of a right kidney weighing 40 grms. Obliteration of right ureter. Compensatory hypertrophy of left kidney which shows acute glomerulo-nephritis.

Chronic diffuse nephritis of right kidney. Abnormal kidney on left, wt. 10 grams.

Kidneys abnormal. Left is lobulated. Right kidney 5x4x1 cm.

Abnormality of left kidney. Double ureters.

Part 2. The analysis of the urine from patients with advanced tuberculosis of the lungs to determine the frequency of associated tubercular kidney infection.

	Bilateral	Right Side	Left Side	Not Stated
Cloudy swelling of kidneys	11			
Hydronephrosis		1		
Hydronephrosis from prostatic obstruction			4	
Hydronephrosis from stricture of urethra			1	
Fatty degeneration of kidneys	44	1		
Fatty degeneration and old infarcts of kidney		1		
Fatty degeneration and cyst of kidney		1		
Senile atrophy of kidneys	1			
Chronic glomerulo-nephritis				1
Acute intra-capillary glomerulo-nephritis				1
Acute glomerulo-nephritis				2
Chronic diffuse nephritis				51
Chronic diffuse nephritis and papillary adenocystoma of left kidney				1
Chronic interstitial nephritis				71
Chronic interstitial nephritis with cyst of kidney	2		1	
Chronic suppurative interstitial nephritis and amyloid infiltration of kidneys				1
Chronic interstitial nephritis with multiple fibrous foci				1
Chronic interstitial nephritis and fatty degeneration				1
Chronic interstitial nephritis with fœtal lobulation of right kidney				1
Chronic interstitial nephritis and infarcts of kidneys				1
Chronic passive congestion of kidneys	33			
Chronic passive congestion with cysts of kidneys	2			
Acute parenchymatous degeneration of kidneys	6		1	
Acute parenchymatous nephritis				1
Chronic parenchymatous nephritis				2
Amyloid infiltration of kidneys	8			
Amyloid infiltration of kidneys and chronic diffuse nephritis				1
Acute hyperæmia of kidneys		1		
Colloid cysts of kidneys	6	1		
Cystic degeneration of kidneys	1	2		
Cystic degeneration of kidneys with kidney and ureteral calculi				1
Colloid cysts of kidneys and chronic diffuse nephritis				1
Calculi of kidney			2	
Adeno-carcinoma of kidney		1		
Hypernephroma of kidney		1		
Malignant metastases in kidneys				2
Carcinomatous metastases in kidneys	1			
Pyelonephritis bilateral with multiple calculi in right kidney				2
Pyelonephritis from enlarged prostate				3
Pyelonephritis from cancer of bladder				1
Sub-acute pyelitis				2
Acute pyelitis and pyelonephritis from prostatic hypertrophy				2
Healed infarcts of kidneys	7			
Acute septic infarcts of both kidneys				1
Abscesses of kidneys				1
Sub-acute nephritis with marked fatty degeneration				1
Fibrous areas				21
Normal				167

To determine this point, the urines from seventy-five patients with marked signs of phthisis, and in whom the tubercle bacillus had been demonstrated in the sputum were carefully analyzed.

Twenty-five of these urines were examined by myself, and used for the inoculation experiments which form Part 3 of this paper. Dr. A. S. Torrey, one of my House Officers at the Long Island Hospital, has made a careful examination of the urine from fifty other patients in the hospital, in whom marked lesions of tuberculosis of the lungs had been demonstrated. Of these seventy-five urines examined, seventy-two were normal, and three contained a slight trace of albumin. The three urines containing albumin were inoculated into guinea pigs and the pigs did not develop tuberculosis.

In connection with the presence of albumin in the urine of patients with tuberculosis of the lungs, Walsh (*Trans. of the Nat. Asso. for the Study and Prevention of Tuberculosis,* 1906), states that in his personal study of the urine in tuberculous cases, he found albumin but twice in forty-four cases in which the supposed tubercle bacillus was demonstrated in the urine by straining.

Gauche, quoted by Guihal (*Gaz. des hôp.,* 1902. Nov. 7-10) found albumin in the urine of nine out of forty-six tuberculous cases. Lacombe, six out of one hundred; LeNoir two hundred and eighty out of seven hundred and fifteen; Andiganne, fifty out of one hundred. If the presence of albumin is any evidence of tuberculosis in the kidney, as one might suppose to be the case, there is some reason to believe that tuberculosis was not present in the kidneys of the seventy-five cases with pulmonary tuberculosis from whom these examinations were made.

Part 3. Experimental work to obtain data in regard to whether or not the tubercle bacillus is eliminated from the general circulation by the kidneys without producing tuberculosis of these organs.

It is believed that the tubercle bacillus usually finds its way

into the blood stream through the close association of a tubercular process with a blood vessel and that the bacillus thus entering the general circulation is often eliminated through the kidneys without causing a tubercular process in these organs. This belief seems to have its foundation in the discovery of organisms in the urines of tubercular individuals which resemble the tubercle bacillus by the straining tests.

Flick & Walsh, (*Proc. Path. Soc. of Phil.*, N. S. No. 6, 1902-1903), in sixty cases of clinical tuberculosis "taken at random" record forty-four as showing the tubercle bacillus in the urine by straining the sediment. Only two of these urines contained albumin. Five of these urines in which the supposed tubercle bacillus has been demonstrated by staining methods were inoculated into guinea pigs. Two of these pigs died within one week from septicæmia, the remaining three showed no signs of tuberculosis three months after inoculation.

In view of the results of these inoculations some suspicion must be entertained as to the accuracy of determining the tubercle bacillus by staining methods.

To determine whether or not the tubercle bacillus passes through the kidneys without infecting these organs in patients with tuberculosis of the lungs, I have chosen to disregard the staining of sediments for the organism. The urines employed in these experiments were determined to be normal by analysis. These urines were centrifugalized and inoculated into guinea pigs.

Each patient from whom the urine was collected for these inoculation experiments had the tubercle bacillus demonstrated in the sputum, and had physical signs of pulmonary tuberculosis. None of these individuals (all males) had any symptoms referable to the genito-urinary tract, and the physical examination of the external genitals, prostate and vesicles was negative. The urine was found to be normal before it was used for the inoculations.

The urine used for the tests was collected in a sterile 500 c. c. wide mouthed bottle. The amount of urine in all cases was

over 400 c. c., usually 500 c. c. The urine was passed directly into the sterile bottle, and the total amount represented several evacuations during a period of twenty-four hours. Of these mixed urines 200 c. c. were taken for centrifugalization. The centrifugalization was performed by an electrical centrifugal machine at about a speed of two thousand revolutions per minute, fifteen minutes' time being allowed for each urine. The sediment thrown down in each case was very slight, and was pipetted from the centrifugal tubes. The pipetted urine was placed in a small glass bottle from which it was taken by means of a sterilized glass syringe, and the inoculation made subcutaneously and intra-abdominally at least 50 m. being used in each injection.

Following is a detailed account of the experiments:

(From the Laboratory of Theory and Practice, Harvard Medical School.)

No. 1. J. R. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction normally acid. Specific gravity 1024. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed March 31st, 1909, forty-two days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 2. E. D. Early tuberculosis of the lungs. Urine examination. Color normal. Reaction alkaline. Specific gravity 1025. Albumin absent. Sediment, none.

Inoculation, Feb. 17th, 1909.

Pig was killed April 5th, 1909, forty-seven days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 3. J. C. Far advanced tuberculosis of lungs. Urine

examination. Color normal. Reaction acid. Specific gravity 1010. Albumin slightest possible trace. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed March 31st, 1909, forty-two days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 4. R. G. Far advanced tuberculosis of lungs. Urine examination. Urine normal.

Inoculation, Feb. 17th, 1909.

Pig was killed May 4th, 1909, seventy-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 5. J. H. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1015. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed May 4th, 1909, seventy-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 6. J. McC. Advanced chronic tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1016. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig died March 15th, 1909, twenty-three days after inoculation.

Autopsy. Lesions of tuberculosis in lungs, liver and spleen. Smear from these organs positive.

No, 7. J. S. Advanced tuberculosis of lungs. Urine examination. Color normal. Reaction alkaline. Specific gravity, 1025. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed May 4th, 1909, seventy-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 8. J. McL. Advanced chronic tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1016. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed March 31st, 1909, forty-two days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 9. C. McC. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1016. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed March 31st, 1909, forty-two days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. One node in mesentery, slightly enlarged. Node macerated. Smears. No evidence of tuberculosis. No bronchial lymph nodes.

No. 10. C. W. Advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1020. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed March 31st, 1909, forty-two days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. A few small nodes in mesentery, smears of which prove negative. No bronchial lymph nodes.

No. 11. J. McD. Advanced tuberculosis of the lungs.

Urine examination. Color normal. Reaction neutral. Specific gravity 1020. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed April 5th, 1909, forty-seven days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 12. J. B. Advanced tuberculosis of the lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1015. Albumin absent. Sediment none.

Inoculation, Feb. 17th, 1909.

Pig was killed May 4th, 1909, seventy-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 13. J. C. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1016. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 14. T. H. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1012. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 15. J. F. Moderately advanced tuberculosis of lungs.

Urine examination. Color normal. Reaction neutral. Specific gravity 1016. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 16. W. C. Advanced tuberculosis of lungs. Urine examination. Color normal Reaction acid. Specific gravity 1018. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 17. C. O'M. Advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1012. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 18. N. McG. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction acid. Specific gravity 1030. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig died April 14th, 1909, thirty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes. Thorax contains a puriform material, smear of which shows no tuberculosis.

No. 19. H. B. Moderately advanced tuberculosis of lungs.

Urine examination. Color normal. Reaction neutral. Specific gravity 1019. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 20. J. D. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction acid. Specific gravity 1012. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 21. J. M. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1012. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig died March 10th, 1909, one day after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. A few nodes found in mesentery, smear of which shows no tuberculosis. No bronchial lymph nodes. Left ear and side of head eaten away. Pig probably killed by a rat.

No. 22. J. W. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction acid. Specific gravity 1021. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 23. M. McC. Advanced tuberculosis of the lungs. Urine examination. Color normal. Reaction acid. Specific gravity 1013. Albumin none. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 24. G. W. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1013. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig was killed May 4th, 1909, fifty-six days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs normal. No mesenteric nodes. No bronchial lymph nodes.

No. 25. J. T. Moderately advanced tuberculosis of lungs. Urine examination. Color normal. Reaction neutral. Specific gravity 1025. Albumin absent. Sediment none.

Inoculation, March 9th, 1909.

Pig died March 17th, 1909, eight days after inoculation.

Autopsy. Abdomen negative. Liver normal. Spleen normal. Kidneys normal. Lungs collapsed. No mesenteric nodes. No bronchial lymph nodes. Thorax filled with blood clot of unknown origin, which was probably the cause of death.

As a result of these twenty-five inoculation experiments, it has been found that there is but one instance in which tuberculosis developed in a guinea pig. A careful physical examination of this patient after the inoculation proved positive, failed to show any evidence of tuberculosis of the external genitals, prostate or seminal vesicles, and repeated urine examinations showed the urine to be normal in every respect. The patient states that he does not remember expectorating into the urine bottle.

It may be, I believe, fairly inferred from these experiments

that it is not common, at least, for the tubercle bacillus to be eliminated through the kidneys without affecting the organ in patients suffering from pulmonary tuberculosis. Of course it may be that these urines were collected at a time at which there was no communication between the tubercular process and a blood vessel in the lungs, and that if the experiments were repeated many times, at different intervals, the results might be different. It does seem, however, that if it is the common thing for the bacillus to be eliminated in the urine in the usual form of phthisis that we should have found in twenty-five inoculations more than one positive result. The possibility of contamination must be considered. It is most probable that the positive case will come to autopsy, and the condition at that time will be noted and recorded with future work to be undertaken upon this subject.

It may be that the bacillus is eliminated through the kidney in the miliary form of the disease in some instances, as there were sixty-three cases of miliary tuberculosis while only forty-six showed miliary tuberculosis of the kidney. Further evidence in favor of the passage of the organism through the kidney in the miliary form of the disease is found in the five cases referred to in Part I, in which there was tuberculosis of the liver and spleen without evidence of the disease in the kidney.

These experiments show at least that it is not common for the bacillus of tuberculosis to be eliminated in the urine, in individuals with the usual form of pulmonary tuberculosis.

DISCUSSION

DR. FRANCIS R. HAGNER of Washington. I am very much interested in Dr Cunningham's paper, and I think he is to be congratulated. It is very easy to say that tuberculosis of the kidney is not a primary disease. It probably is not. But, at the same time, *practically* it is often a primary disease, because we know that if we have tuberculosis of the kidney and take that kidney out, if the other kidney is not involved, the patient will get well, and the bladder tuberculosis gets well. As to determining whether the other kidney is involved, I believe we can make a diagnosis of tuberculosis of a kidney only after it has become considerably involved,

because we cannot make a diagnosis until ulceration has taken place in the pelvis, and as all these cases are hæmatogenous, the peripheral portion of the kidney is the first part involved.

I have been very much interested in the frequency of tuberculosis of the kidney in tuberculosis of the lungs. I requested the Tuberculosis Hospital in Washington to watch that for me. They have had sixty-five autopsies of patients who had died from pulmonary tuberculosis, and in not one of those cases was tuberculosis of the kidney or urinary tract present.

DR. F. TILDEN BROWN of New York: I would like to say a few words about this paper. I want to congratulate the reader upon the valuable work which he has done, or to make one or two comments about the results which I have found in a somewhat similar work, not original, but in the overlooking of statistics. I think that for our purposes in surgery it is well to keep clear the miliary cases from the caseating, chronic cases, because if we try to pay any attention to the statistics of miliary tuberculosis of the lungs and the other organs—it is a matter of interest but it is a waste of time, because these cases of miliary disease do not concern us at all. In the chronic, caseous form of the disease I was surprised that Dr. Cunningham's statistics showed so relatively large a number of involvements of both kidneys. The statistics which I went over some years ago and the results of special investigations by the pathologist at the Presbyterian Hospital led to the conclusion that the proportion between the unilateral and bilateral renal involvement was, as I remember it, about even. And, by the way, none of these cases of involvement of the kidneys, liver and spleen were without evidences of a primary pulmonary tuberculosis, although in some cases the pulmonary lesion had healed.

I think the first claim in the matter of the interesting and valuable personal work done by Dr. Cunningham in attempting to prove or disprove the assertion that active, living tubercle bacilli are passed through the kidneys and thus either free the system at large or the kidneys in particular from infection, was based upon the microscopic findings of Steinthal, who made sections of the kidneys, and tubercle bacilli were found in the cells of the glomeruli where they were apparently on the point of being passed on into the urinary stream, and lying there without having instituted any pathological process at their site. It seems to me that, in view of the very great infrequency of involvement of the kidneys

in the course of general pulmonary tuberculosis, a much larger number would have to be investigated before this assertion could be positively made or denied.

DR. CUNNINGHAM. In regard to Dr. Hagner's remarks about renal tuberculosis being primary, I think it is generally regarded that tuberculosis may be primary in the kidney as regards the genito-urinary tract. It is very difficult however to say that it is actually primary in the kidney in relation to the whole body because one usually finds some evidence of tuberculosis post mortem if the search is made carefully enough.

The cases collected by Bevan post mortem, 12,732, show bilateral infection to be 62.3 per cent., and unilateral 37.6 per cent. My cases show, as Dr. Brown has suggested, a relatively high bilateral infection which should be expected if the kidney is infected secondarily from a tuberculosis in another part of the body. Of the 70 cases of tuberculous infection of the kidney, 59, or 84 per cent., were bilateral, and 11, or 15 per cent., unilateral. Dr. Brown has also sounded what I think is a very important thing in the compiling of statistics in regard to this point, that we should not consider the miliary form. I have tried to separate those, there being 59 bilateral, of which 46 were miliary, or 77 per cent. Thirteen were caseous, or 22 per cent. This figure, however, is higher than previously stated by other writers but as I have said my cases all have active pulmonary tuberculosis from which the kidney might have become infected.

There is a very large difference between the ante mortem and the post mortem findings of tuberculosis of the kidneys as regards its being unilateral or bilateral. For instance, Bevan states that of his series of post mortem cases 62.3 per cent. were bilateral clinically; Krohnlein mentions a series in which 92 per cent. were unilateral and 8 per cent. bilateral; Israel only 8.3 per cent. bilateral; Facklam 9 per cent. bilateral. So that there is a very large difference between the clinical and post mortem findings. The question immediately comes up as to whether or not our methods of diagnosis of this condition are sufficiently accurate to find it ante mortem as frequently as it exists, or whether or not terminal infections of the kidney in tuberculosis of the lungs are very common. I think it is to be doubted if there is a difference as great as Bevan's 62.3 bilateral post mortem cases against the others' 8 or 9 per cent. ante mortem.

DR. EDWARD L. KEYES, JR., of New York: I have recently had a case

which bears very interestingly upon this very point of the difference between the clinical and the pathological findings in cases of tuberculosis of the kidney.

Ten years ago a patient came to one of the most distinguished surgeons in New York City with renal colic, which the surgeon attributed to stone in the right renal pelvis. He did not and could not have recourse either to the X-ray or to the ureteral catheter. He operated upon the right kidney by a transverse incision and stated to the patient at the time that he had examined both kidneys, which may mean that he made an intra-peritoneal incision. He, of course, did examine the right kidney and alleged that it was entirely normal. He replaced it. Renal colic stopped. The vesical symptoms, which had been mild before, became intensely prominent. Prostate, epididymides and vesicles became infected and finally the patient came into my hands last year in so bad a condition, that I could not cystoscope him. But an X-ray showed an apparently complete destruction of the right kidney, and I therefore took his life into my hands and removed a typical tuberculous right kidney, and I am happy to say he has survived the operation. Undoubtedly there was tuberculosis in that right kidney at the time of the first operation.

I fancy that many of the older cases operated upon successfully for supposed unilateral tuberculosis were actually cases of bilateral tuberculosis, and that the course of the case is so slow that we put the case down as a successful operation. I have seen two patients recently who have had tuberculosis in at least one kidney for fourteen years. One of these is the one above mentioned. The other one has undoubtedly tuberculosis of the left kidney. It has been proved by the ureteral catheter and the X-ray and by finding bacilli in the urine, and yet at present his symptoms are and have been for the past three or four years entirely quiescent. He absolutely refuses to have anything done. Therefore, it is conceivable that if this man had bilateral tuberculosis in the beginning and had had one kidney removed ten or twelve years ago, he would still pass for a complete cure of urinary tuberculosis by removal of that kidney.

DR. ROBERT H. GREENE of New York: I do not like to have Dr. Cunningham's paper passed without expressing my approbation of it, because I believe it is just along that line of work that we are eventually going to find out something in regard to tuberculosis of the kidney. At the City Hospital in New York we have a large number of patients with tuberculosis in various portions of the genito-urinary tract. When they die we almost invariably find a terminal tuberculosis in the kidney, with-

out there being any evidence clinically of the kidneys being infected. I think the pathologists consider that these are cases of terminal tuberculosis, and not tuberculosis of the kidney as we surgeons ordinarily see it. But, on the other hand, in patients dying from tuberculosis of the lung it has been the general custom of the men who make the autopsies to look at the kidneys, and if they were healthy to the eye, to put them down as being healthy. Work has been done to show that if sections are made of these kidneys which are apparently healthy, in persons dying from tuberculosis of the lungs, not infrequently evidence of tuberculosis could be found in a kidney which was apparently healthy. I think the view which Dr. Keyes takes of it is the correct one so far as my experience goes at the present time.

RADICAL OPERATION FOR TUBERCULOSIS OF THE MALE GENITAL ORGANS

By GEORGE S. WHITESIDE, M. D., of Portland, Oregon.

AFTER considerable experience with tubercle of the genital organs, I have been gradually led to believe operation a most valuable preliminary aid to other treatment in a large percentage of cases, particularly the advanced ones. I have also found that the most successful cases were the ones in which the most radical removal of diseased tissue had been performed. My cases have, perhaps, been too few to draw final conclusions from, but believing they teach some valuable facts which, although not new, may be looked at from a little different point of view, I will briefly report a few cases.

Mr. H. K., 38 years old, single, consulted me in October, 1902, and gave the following history. In 1893 Dr. Willy Meyer did left orchidectomy for tubercle of the epididymis. In 1894 Dr. Bolton Bangs did combined suprapubic and perineal curettage of the bladder for tubercle. Since then he has spent two years in Arizona and six years in New York. Has gained 10 lbs. in weight. Feels well. Has had no symptoms for seven years. Wants to get married and so consults me. Cystoscopy

shows a perfectly normal bladder except for scar tissue at the fundus where the suprapubic wound was and some small scars where ulcers were curetted. Physical examination of chest, abdomen, and other testicle and the prostate discovers no disease. Urine examination negative. I believe this man to be entirely well. It will be noticed that the first operation (removal of the testicle) did not eradicate the disease. A second operation a year later was necessary.

I have operated on seven cases in all by removal of the diseased testicle, and in three others the operation, although more extensive was still far from complete, and all but one have had recrudescence of the disease within a few months. Consequently more radical measures seem to me to be advisable. The literature on the subject does not lead one to expect involvement of the testicle, seminal vesicles, and prostate in every case of tuberculous epididymitis, but experience has proved to me that these organs seldom escape infection. So if the epididymis alone or even the epididymis and testicle are removed, dangerous foci of disease remain. I do not believe bladder infection so great a menace. The following case illustrates this point and the method of operation which has given me best results.

Feb. 15th, 1908, Y. A., 34 years old, single, was sent to me at the Medical School free clinic. For two years he had suffered from frequent urination and gradually increasing pain in the bladder. Two months ago the right epididymis began to swell. Not painful. Now the testicle is involved in a large indurated mass the size of a goose egg. On the other side the scrotal integument is slightly reddened and a feeling of deep fluctuation is evident. Rectal examination shows the cord hard and as large as one's finger, prostate contains nodules on the right, and right seminal vesicle is indurated. Bladder capacity only 30 c. c. Tubercle bacilli in the urine. Dr. Yenney pronounced the lungs sound. Operation Feb. 24th at St. Vincent's Hospital. The right testicle removed through an incision extending into the inguinal region in the usual way. The cord was then freed from the surrounding tissues as far into the inguinal canal as possible.

There it was clamped and cut off. Then the patient was placed in the lithotomy position and a semi-lunar incision with its convexity anteriorly was made extending between the tuber ischii. After dividing the central tendon of the perineum the rectum was pushed backward and by blunt dissection, following the plane of the recto-vesical fascia, a deep pyramidal shaped wound was made which gave easy access to the prostate and seminal vesicles. By pushing the finger up to the apex of this deep wound and by pushing downward and backward on the forceps, which had been previously clamped to the cut end of the vas deferens in the inguinal canal, it was found possible to push this clamp through into the perineal wound carrying the cord with it. By removing this anterior clamp and replacing it with another through the perineal wound, it was found possible to remove the entire spermatic cord with the seminal vesicle on the right side and the right lateral lobe of the prostate. Having thus excised all the tuberculous tissue which it was possible to reach, the anterior wound was closed without drainage and the perineal one was closed, leaving a small amout of gauze packing for drainage. This was the first time that I had ever performed this operation and, so far as I know, it was an original procedure. The time of operation was almost three hours, owing chiefly to the difficulties attendant upon the removal of the seminal vesicle at the bottom of a deep wound. The patient was returned to bed in good condition, the gauze was removed after 24 hours from the perineal wound. Convalescence was uninterrupted, the patient being up and about on the 10th day. On March 17th the patient was in good condition but complained that he still suffered from vesical tenesmus. He was given tuberculin, hypodermically, as prepared by Mulford. The day after this injection the vesical symptoms were very much better. Frequency was less and pain relieved. On the 21st .20 c. c. were given with the corresponding good result. This was repeated on the 27th and 30th. By this time urination was much less frequent and the pain had entirely disappeared. The patient was then discharged relieved and went to Huntington, Oregon. There he came under the care of Dr.

Spencer who gave him two injections in the month of April, dosage not stated. In May, '08, the patient wrote to me saying that he felt entirely well, had gained weight and was working in a sheep camp not far from Huntington. Since he had not felt well enough to do any work for more than a year, I consider the result very gratifying. In this case it was possible to remove all the infected tissue without breaking it up and so disseminating tubercle bacilli in the wound. Consequently, healing was by first intention. I believe this of great importance, but I have not always found it practicable. The bladder infection (in this case I believe it is fair to infer that there was such infection) seems to quiet down and get well under the use of tuberculin whether operation has been done or not. The following case illustrates this point.

October 9th, 1908, Miss F. S. was referred to me for an acute exacerbation of vesical tuberculosis. Two years before she had had a similar attack but not so severe as this one. One and one-half years ago she was operated upon for tubercular pyosalpinx and very extensive signs of tubercle were found in the general abdominal cavity. The present bladder attack began three weeks before I saw her. Symptoms, frequency, pain and hæmaturia. Many tubercle bacilli found in the urine. I gave her tuberculin and after two doses the pain and frequency were very much improved. Whereas, when I first saw her, she passed bloody urine every 20 minutes day and night, a week after tuberculin treatment was begun she slept continuously 12 hours without an opiate. Since then she has been constantly under my care. At the present time (April 10th, '09) there are no bacilli to be found in the urine and no symptoms referred to the bladder.

It has been my experience that no form of tubercular infection responds so promptly and so satisfactorily to tuberculin treatment as bladder tuberculosis. Consequently, I do not look upon a bladder infection as of much importance in cases of genital tubercle. On the other hand it may be made use of as an index or guide to treatment. If the dose of tuberculin is too large the

PLATE II.—Presented by Dr. George S. Whiteside.

Fig. 1.

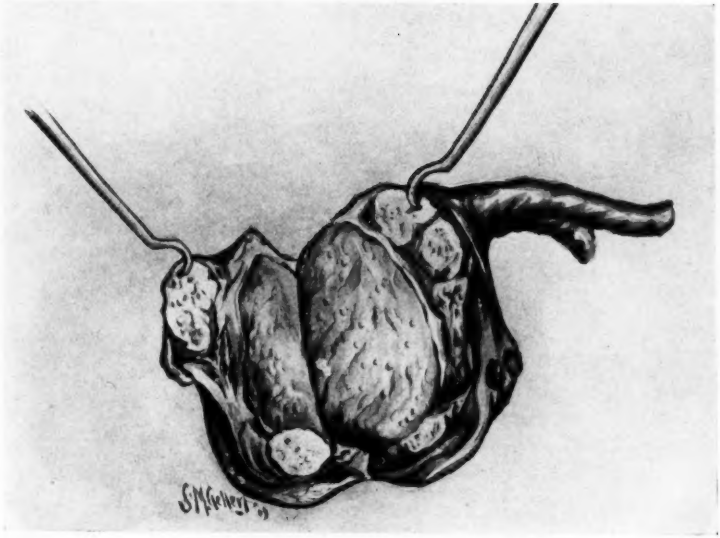


Fig. 2.

bladder will immediately give notice by pain and frequency. If the dose is a proper one the bladder is immedaitely relieved. When frequency and pain begin to grow more prominent, it is a reliable guide that another tuberculin injection should be given. For this reason a mild bladder infection is a help rather than otherwise.

When, in the operation above described, tubercular tissue is broken up and tubercular material spread in the wound, a post operative sinus will surely result. The two following cases illustrate this point.

In March, 1908, A. D., 28, single, consulted me and related the following history. August, 1907, contracted a gonorrhea. Treated by a doctor in Lewiston, Idaho. The discharge stopped in six weeks. In January, 1908, received a blow on the testicle. To this injury he refers the swelling of epididymis. Examination shows well developed and nourished man. Lungs, heart and abdomen negative. Right epididymis and testicle involved in a tumor almost the size of one's fist. Over the posterior aspect of this tumor the skin is reddened and a fluctuating spot toward the centre of the hyperæmic area shows pus very near the surface. The spermatic cord, seminal vesicle and prostate involved on the right. Symptoms of bladder involvement very slight. No cystoscopic examination. Urine acid. Not much sediment. Small amount of pus. Tubercle bacilli not found. Operation March 12th, 1908. Technic similar to that described for last case. However in this man the perineal part of the operation was much more difficult because his pelvic outlet was very narrow and the wound between the bladder and the rectum very deep. Also in this case venous hemorrhage was troublesome. After removal of the testicle with the cord and after removal of the structures at the base of the bladder it was found necessary to pack the perineal wound with gauze to stop the oozing. The tumor, after removal, was cut and the epididymis found to be merely a shell of thickened tissue forming the walls of an abscess. Other small abscesses were scattered through the tumor and in the seminal vesicle and portion of prostate removed. Time of opera-

tion three hours. Patient returned to bed in good condition. Forty-eight hours later the gauze packing was removed from the perineal wound. The next day it was evident that injury, either at time of operation or from pressure of the gauze packing, had caused a fistula into the rectum. April 20th, five weeks after operation, patient left the hospital but the fistula in ano remained patent.

April 10th. The first tuberculin injection of .08 c. c. Koch's O. T. (Mulford) Serial dilution No. 1 given. This did not cause reaction. Three injections were given in April. Patient not seen between May 1st and May 20th. Two injections given in May on the 20th and 27th. The last injection .20 c. c. Same tuberculin was given. This dose caused a rise of temperature and the usual signs of overdose. Consequently, I thought best to omit further injections until the fever had subsided.

June 11th. The fistula in ano not having healed at all, the patient was given ether and the fistula cut through the sphincter into the rectum.

July 30th. The wound of this second operation almost but not quite healed.

Aug. 10th. Tuberculin injections resumed. .05 c. c. same solution given.

Aug. 20th. .10 c. c. same.

Sept. 1st. .20 c. c. same. Note on this date is that patient has gained 10 pounds in weight, fistula entirely healed, feels strong and well. Is doing heavy laboring work.

Oct. 5th. Has gained more weight. .20 c. c. same solution given without reaction or untoward result. Feels perfectly well. All demonstrable evidence of disease has disappeared.

In April, 1908, W. R., 37, single, came to me with what appeared to be a tubercular nodule in the left epididymis. No other evidence of disease. I advised operation but he declined it. In February, '09, he returned. The testicle and epididymis were then both involved in a mass as large as one's fist. There had been an abscess and a sinus remained. The vas deferens was hard and enlarged. The prostate and seminal vesicles showed in-

volvement. A slight infection of the apex of the right lung rendered the prognosis more doubtful but operation was advised and accepted. The operation went smoothly until I attempted to poke the vas deferens through from the anterior wound to the posterior one. The vas broke off. Prolonged search failed to find a piece about two inches long. Convalescence was uneventful but there remains at present writing (April 10, 1909) a small fistula leading downward in the anterior scar and a similar one upward in the posterior one. These approach each other but do not connect. Probably a secondary operation will have to be done to close these fistulae.

This illustrates the danger of continuing infection after operation if any tuberculous material is left. I believe this very important. I have given enough cases for illustration. The recital of more would be tedious. I have now operated on 12 in all by this method. Six appear to be well. All are alive. I have had no mortality as yet. The six later cases are too recent to report at this time. Even the first six cases are really recent ones. Consequently, this paper is necessarily a preliminary report. I believe at least 10 years should elapse without recurrence before complete cure is claimed. Even an early report is valuable. Thoughtful surgeons will not accept it as final but it invites criticism and crystallizes our knowledge on the subject as far as it goes. I have, therefore, presented this paper for your critical consideration.

DISCUSSION

DR. FRANCIS S. WATSON of Boston. A word, in the first place, in regard to the absence of testimony respecting the influence of climatic and hygienic treatment as compared with surgery in cases of testicular, epididymal and lower tract tuberculosis. I cannot find out that we know much about it, and it seems to be a very important thing that we should know. I say "important," because the question of eradicating the disease wholly by operative means is by no means easy, and because I have been impressed by a small personal experience in my own practice by the possibilities of the non-operative, hygienic treatment, having had ten cases in which the patients have had testicular or epididymeal tuberculosis who

have been under observation for periods varying from eight to twenty years, and in those cases no important extension of the disease has taken place. The first patient was a cab driver who lived out of doors night and day. The others had the opportunity to lead exceedingly fortunate lives with reference to tuberculosis, and in none of those cases has there been an extension of the disease.

When we look into the surgical treatment, it is very interesting to note the differences of opinion that are expressed. Some of you are familiar no doubt with the statistics that Bruns gives from the Tübingen clinic, in which there was a very favorable showing of the results of surgical treatment. One hundred patients who had been submitted to unilateral or bilateral castration for tuberculous tests, were under observation for periods of from three to thirty years, and the percentage of recoveries apparently was found to have been very large in that series.

With regard to the radical operation, I performed it for the first time two weeks ago and had the advantage of having Dr. Whiteside present. The patient had tuberculosis of the testicle, seminal vesicles and prostate. I took them all out. The patient has done perfectly well. This man has vesical tuberculosis without any question, and I am very anxious to see what the result will be of the employment of tuberculin, upon the disease of the bladder.

There is one little point about the operative technique of the total extirpation of these organs that I will note, that is, the advantage of making a median incision rather than going in from the groin. It occurred to me in my own case to which I have just referred that the easier way would be to do a combined operation, beginning in the perineum, then to make a median suprapubic incision, push the peritoneum from the abdominal wall and the bladder, turn the bladder to one side, catch the vas at the internal ring, pull it toward the median line, divide it between two pairs of forceps, then to take the lower end off at the prostate, remove the seminal vesicle, then draw the remaining part of the vas back again toward the internal inguinal ring, free the testicle, and free that from the ring and canal of the vas at the internal ring. The prostate was removed last. The operation took a long time. I could do it in half the time in another case.

Dr. L. Bolton Bangs of New York. These two papers interest me extremely, because after a considerable amount of radical and useless surgery upon genito-urinary tuberculosis, I have come to a change of opinion, and in this change of opinion I am confirmed by the results claimed from the so-called vaccination—a word to which I object; perhaps inocula-

tion would be a better word. And I am still further confirmed in this opinion by later years of clinical observation, which it is not necessary for me to detail, since the cases are familiar to you all. But I do not operate now, except in special cases where the primary focus can be removed without too much traumatism and shock to the patient, because from the traumatism following the removal of one testicle I have seen an immediate outbreak in the other testicle. So, I believe in operating in these cases only where the primary focus can be removed by an easy operation and without suspending the hygienic treatment of tuberculin. Dr. Trudeau recently stated in relation to a case in which we were both interested, that he had observed in his large experience that the patients with genito-urinary, particularly vesical, tuberculosis respond better to tuberculin inoculation than those suffering from pulmonary tuberculosis.

Dr. F. Tilden Brown of New York. I want to ask Dr. Whiteside whether he made use of the tuberculin treatment in any of these cases previous to operation. In our limited experience I think we are impressed with the idea that not only vesical tuberculosis, but those forms of mixed tuberculosis of the lower genital organs in the male and possibly the bladder involvement, are more favorably influenced by that treatment than other forms of urinary tuberculosis.

As far as renal tuberculosis is concerned, a year and a half ago I had great hope that we had at last come upon something which was going to save a great many people from nephrectomy, but since then I have followed two youngish people who during the last year have had every such advantage, and one of them a long course at Saranac, where she was at last advised that she was not making progress, and finally came to the operation of nephrectomy, and with gratifying results. I long ago came to the conclusion, agreeing with Dr. Bangs, that these operations which were at one time so much extolled, such as epididymectomy and even orchidectomy, were delusions, that they involved subjective faults, and yet at the time they were introduced, the highest praise was passed upon the results. I am inclined to agree with Dr. Whiteside in choosing either one extreme or the other—either allowing these cases to remain unoperated upon—and that is rather my inclination—until I am sure that the case is a progressive one, because I am satisfied from the notes of some cases which I have on hand that it is a very stationary process in some cases; or if anything is to be done that this most thorough and admirable procedure of Dr. Whiteside's should be carried out. It is no small matter to tell a young man—and almost all of these cases are in men between eighteen

and twenty-four years of age—that he must part with all of his genital procreative tract.

Dr. Francis R. Hagner of Washington, D. C. I should like to ask Dr. Whiteside if the urine of that first case he reported is now entirely free from pus. The reason I ask that is that Dr. Pardeau told me in London that they have been using tuberculin in the treatment of tubercular involvment of the bladder several years, and that they had never cured a case. He said that the cases were relieved of their symptoms, but never cured. I have had some few cases of my own, and I have never seen a case where the pus has disappeared, unless it be limited to one kidney and that kidney removed. If tuberculosis of the bladder is present, under the tuberculin treatment the symptoms subside, but the pus does not clear up entirely, and it seems to me that it is necessary for those patients to take tuberculin practically as long as they live.

Dr. Martin J. Echeverria of New York. In connection with this case I should like to relate my unfortunate experience in three cases of tuberculosis in which sudden death occurred within a short time after the operation, and to ask if any of the members of the Association have had a similar experience. I had a case of what proved to be tuberculous peritonitis, in a patient twenty-five years of age, who was brought to me for operation. The diagnosis of a possible ovarian cyst had been made, or possibly a fibroid. The abdomen contained a large mass, and there was fluid in the peritoneal cavity. I made an exploratory incision, and after opening the abdomen the evidences of a tuberculous condition were so plain that we did nothing further. The woman made a perfect recovery, without a rise in temperature. On the fourteenth day after the operation, as she was anxious to go home in two days, I allowed her to sit up in bed, and I left her at about eight o'clock in the evening. The nurse came in within a few minutes after I left. The patient sat up and drank some milk, and promptly died. Unfortunately there was no autopsy.

In another case I operated for tuberculosis of the testicle and did a castration. The patient did perfectly well. Three months after that he died suddenly, and autopsy proved this to be due to an embolus of the coronary artery.

The third case was a student who was brought to me in consultation because he had an epididymitis, supposed to be traumatic, the result of a blow from a walking stick. From the clinical examination of the case and the fact that his seminal vesicles presented the usual evidence of a tuberculous condition, I decided that the case was probably one of tuberculosis

of the epididymis. Whether the blow was the determining cause in spreading the process, I do not know. This young man refused operation. I did not advise it very strongly. Within a week after my seeing him he went to the bathroom and died, and Dr. Powell made a diagnosis of death from embolus.

Ever since I had those three cases I have been wondering whether there was anything in the tuberculous condition that would lead us to believe that we incur any more danger of embolus in tuberculosis than in other cases.

Dr. John H. Cunningham, Jr., of Boston. It seems to me that Dr. Whiteside has brought out a very important point in the idea that tuberculosis of the epididymis does not remain localized but continues along the genital tract. From the autopsy records at the Boston City Hospital I have been able to collect twenty cases of tubercular epididymitis in which microscopic examination was made of the prostate and seminal vesicles. It is interesting to see that in these twenty cases it was bilateral in the epididymis in eleven, and in nine it was unilateral. Of these twenty cases the prostate was involved in eleven. The seminal vesicle also in eleven. When the vesicle was involved the prostate was also involved in each instance. Of the eleven bilateral cases of tubercular epididymides, involvement of the seminal vesicle was bilateral in seven, unilateral in four. Of the twenty cases the testicle was involved in only four. Two of the cases, involving the epididymis, vesicle and prostate were caseous; suggesting primary tuberculosis in the epididymis, there being an acute miliary infection of all the visceral organs in these two instances. There are cases clinically in which it is impossible, I think, to detect tuberculosis in the seminal vesicle even when it is there. I believe, however, that frequently when orchidectomy is performed the tubercular process even if present in slight degrees in the vesicle and prostate does not develop sufficiently to cause symptoms.

From the genito-urinary department of the Boston City Hospital we have had two cases of slight tuberculosis of the epididymis which have been treated with tuberculin, and the treatment seems to have been beneficial. I think, however, that there should be no question when we have tuberculosis as accessible as it is in the epididymis, that the treatment should be surgical and allow the after-treatment to be by tuberculin.

Dr. E. E. King of Toronto. I have three cases that have been under observation for periods varying from two to five years, and each of them has had the tuberculin treatment. One of them is a case of tuberculosis

of the kidney who was seen in consultation by Mr. Fenwick of London. He diagnosed the left kidney involvement, and stated that there was not enough kidney involvement to advocate a nephrectomy, and suggested that we try the tuberculin treatment. When the patient came back to Canada we went on with the tuberculin treatment, and he made a remarkable improvement in his general health. He has had the treatment practically ever since. The tubercle bacilli in the urine have decreased in number, but we have always found them. His weight has increased as much as twenty pounds, and he now practically refuses to have anything done, which I think is perfectly justifiable.

The second case is one of double epididymitis on which I operated at a year' interval also placing this man on tuberculin, which he has had for two years, and we still have tubercle bacilli in the urine, although his condition is otherwise perfect.

In the third case I am at a loss to locate the seat of the trouble. There are plenty of tubercle bacilli in the urine, but he has gained in weight and in every way. He is now undergoing great bodily exertion and mental work with as much ease as the ordinary individual, but he still has the tubercle bacilli there in great numbers.

I have always felt that the tuberculin increased the resistance of the body to tubercle, and that the benefit was derived in that way, and I feel that in most of these cases it should be continued for a long time. It has certainly been very gratifying in these cases to know the benefit that has occurred in these particular instances.

DR. H. A. FOWLER of Washington, D. C. I wish to relate my experience with one case that shows in these cases of tuberculosis of the epididymis and of the prostate that symptomatically they improve very much without any treatment. This case I saw six years ago in Baltimore. At that time he was suffering extremely with frequent urination. The urine was filled with pus, and the tubercle bacilli were found with great ease. Examination showed the left seminal vesicle and prostate very much enlarged and indurated, the left epididymis nodular. He was advised to go West, which he did, and immediately on starting for the West his frequent urination cleared up. He was able to hold his water for several hours, and from that time on he has never had a return of the vesical symptoms. Two years ago he came under observation again, with a swelling of the left epididymis and testicle, forming a large mass which was at first very painful. The skin, however, was not involved. Suppuration did not take place. The condition subsided, and he has remained in practically

that condition for the last six years. The symptom for which he presented himself and of which he complained the most was the vesical irritation, the frequent urination. Since that has subsided, which it did immediately afterwards, he has been perfectly comfortable, and, with the exception of this acute condition supervening in the left epididymis, he has been quite free from symptoms. That case has never had any treatment or operative interference, and there has been no apparent extension of the disease. It simply shows that in some of these cases the condition will remain quiescent—at least, not progressive—for a number of years without any treatment whatever.

DR. ARTHUR T. CABOT of Boston. It seems to me the difficulty we all have is to decide whether to operate in a given case, and the principle upon which I have acted for a good many years is to try and determine whether the tuberculous condition is so developed that the powers of the body, assisted by hygienic measures, can or cannot dispose of it. A small tuberculous process, we know, is disposed of by improving the patient's condition. The forces of the body are assisted, the tuberculous process is encapsulated, and the patient gets well. I think I am in agreement with Dr. Bangs' present position in thinking that hygienic measures will dispose of a large proportion of cases of tuberculosis in the lower genito-urinary tract. We occasionally have a very large suppurating testicle, a profuse suppuration in the prostate, or in the seminal vesicles, in which the process has reached a stage in which the body cannot take care of it, and there, it seems to me, surgery should step in. We never cure a case by operation. We remove the greater part of it, and the forces of nature do the rest. There is one other reason for operating, and that is when the symptoms, the pain, can be relieved by operation, as in Dr. Whiteside's case. The pain and frequency of urination act as a very distinct drag on these patients, and if by operation on such cases the pain and discomfort can be done away with, you have given the patients a distinct lift towards health.

In illustration of the great relief sometimes obtained by hygiene, I recall the case of a doctor. He first came to me with symptoms which he thought were due to stone. There was no stone, but a commencing tuberculosis in the prostate. He went on and presently developed great tenesmus and pain, so that he was in danger of becoming a morphine taker. He went into the Maine woods, at my suggestion and came out after four weeks, with the pain and tenesmus entirely relieved, and he never had any after that time. The process went on, with exacerbations at times. He had an epididymitis, which suppurated. When I saw him again it was

practically healed, and during the last fifteen years that man, who is considerably older than I am, has done an active practice, with a good deal of riding and a good deal of hard work, and has remained practically well.

I think the point is whether the tuberculous process which you relieve at operation is acting as a drag. If so, your operation will do very great good.

DR. WHITESIDE in closing. I do not know that anyone could have summed up the thing better than Dr. Cabot has just done. The question of when to operate is, of course, of paramount importance in these cases, and I want to call attention to the fact that the title of my paper was, "Operation in Advanced Genital Tuberculosis." I do not believe that the early cases should be operated on. I believe they should have treatment by tuberculin, general hygienic measures and climatic measures. On the other hand, there are some cases in which these helps toward increasing the resistance of the body tissues to throw off the disease are not sufficient. I have in mind one of the cases reported in this article, the first one that I operated on, where the man was in extreme pain, and had been practically helpless for two years. He lived, perhaps, not under the best hygienic conditions in some respects, but, on the other hand, he certainly was under good climatic conditions. His work was that of a rustler in a sheep camp, and the country in which he lived was four or five thousand feet above sea level. He was out of doors all the time in the daytime, and slept sometimes without a tent, and sometimes in a tent, and sometimes in a little hut at night, both summer and winter, and had been doing that for years. I presume that he did not acquire his tuberculosis while out on the plains, because we find under all circumstances that in those places very few bacteria of any kind are present to infect people, but he was in the habit of once a year taking a shipment of sheep to Chicago to the stockyards, and I suppose his trouble may have begun on some such expedition. Then after that for more than two years, at any rate, he was living out of doors and getting absolutely fresh air, and living at a high altitude, in a dry climate, where there are only about ten inches of rainfall in a year, and that did not increase his bodily resistance enough to throw off the infection, and he kept getting worse. When I first saw him I came into the dispensary that morning and he was sitting down on the floor crouching on his haunches, so to speak. That peculiar attitude attracted me at once, and I said, "What is the matter with that man? What is he behaving that way for?" He said that was the only position

in which he could get any comfort. He said he had been eating and sleeping in that position for several weeks, because when he sat or lay down or stood up, the pain was almost unbearable. I think, as Dr. Cabot has said, that if that pain continues, its effect on the general health is such that no appreciable advance can be made in resisting the disease. Besides that, he had a tubercular testicle, with much pus, and I do not believe that large collections of pus in the testicle or in the prostate and adjacent structures can be absorbed with advantage to the patient by the process of time and the injection of tuberculin.

In another case, not in this list, because it was a case of kidney tuberculosis, I did a nephrectomy two and a half years ago. She was a trained nurse in the hospital in Portland. She did very well after the operation, and a couple of months after the operation went to her home in northern Idaho in the mountains, and there she lived in comfort. Her father was a prosperous farmer there, and she lived under good conditions, and at a very high altitude, although I do not know the exact altitude. It is something like five and a half or six thousand feet. She gained fifty pounds in weight, and came back to Portland about nine months after operation looking like a different person. She said she would meet acquaintances in the street who did not know her, she looked so different. And yet after she had been back for six months she complained of a little pain on the other side, and she came in, and there were tubercule bacilli in the urine. She has now become a nurse in the Open Air Tuberculosis Sanatorium at Portland, and is receiving treatment and working at the same time.

Those two cases have impressed upon me the fact that climate does not always increase the resistance sufficiently to prevent these things from getting to such a point that operation seems imperative.

A NEW METHOD OF TREATMENT OF PHAGEDENIC CHANCROID AND CHANCRE BY MEANS OF HOT AIR

By E. Wood Ruggles, M. D., of Rochester, N. Y.

TOWARD the close of the last century several investigators announced the discovery of the fact that superheated dry air, at a temperature of from 250 to 400 degrees Fahrenheit, was still more effective in certain diseased conditions than was the hot air or vapor bath. The foremost of

these was not a physician but an instrument maker of London, named Tallerman. The distinctive differences from the Turkish bath, in the new apparatus were that, even when the patient's whole body was to be treated, the head was left outside, thus avoiding the inhalation of hot air or steam, and, secondly, the wrapping of the part treated in some material, as for example a few layers of Turkish toweling, in order to absorb the perspiration as fast as formed. Naturally with this arrangement the real temperature at the part treated is less by a good many degrees than the thermometer indicates.

Tallerman's instrument was demonstrated in London in 1893 and was practically the same as that used to-day, the heat being at present generally provided by a Bunsen burner outside of the apparatus, but connected with it by a tube.

Another model, invented by a physician, utilized the heat furnished by a number of incandescent electric lights, placed within the apparatus. He claimed that the application of heat through direct radiation and the effect of the concentrated light upon the tissues, rendered the apparatus greatly superior to the former. This apparatus is found in all modern hydrotherapeutic establishments.

The method has proved very successful in the treatment of inflamed joints, the reports regarding its value in sciatica, arthritis deformans and rheumatism being contradictory, although many observers are enthusiastic concerning the results in these diseases also. It is certainly of decided efficacy in the treatment of gonorrhœal arthritis, both in respect of relief of pain and in shortening its course. This has been verified by the author.

Dr. George L. Kessler, of Brooklyn, noted carefully the physiological results of superheated dry air upon patients as follows: 1. Contraction and afterwards dilatation of the superficial blood vessels. 2. Pulse increased in strength and rapidity (10 to 25 beats per minute). 3. Body temperature elevated from one to six degrees Fahrenheit. 4. Profuse acid perspiration. 5. Respiratory movements accelerated (two to six per minute). 6. Almost immediate relief from pain and a general

sense of comfort. 7. Nervousness and twitching if too long continued.

The secondary results after several treatments were found to be the softening and absorption of urates and other deposits in the joints, reduction of albumin when present, increased excretion of uric acid and improvement in some chronic skin diseases. In this connection I may state that I have found it of decided assistance in the treatment of generalized psoriasis.

It is a well-established fact that while most bacteria are not destroyed by exposure to cold, some not even by a temperature of 300 degrees below zero, but only inhibited in their action and growth during the time of such exposure, all bacteria are killed by exposure to heat of a degree and duration varying with the several germs. Even the spores of the anthrax bacillus, which is the most resistant of the pathogenic bacteria, are destroyed by exposure to a temperature of 212 degrees Fahr. for ten minutes.

Unfortunately, however, most pathogenic bacteria are only killed by a temperature which living tissues are incapable of enduring without their own impairment or destruction by the process. Only a few are destroyed by a temperature below 130 degrees Fahr. and for a period of ten minutes or longer at their lowest fatal temperature.

The pathogenic bacteria such as may be present in milk as those of tuberculosis, diphtheria, typhoid fever, cholera, the bacillus coli and the ordinary pyogenic germs are destroyed by a temperature of 167 degrees Fahr. continued for twenty minutes, this fact being taken advantage of in the ordinary method of the pasteurization of milk. This temperature, however, does not destroy the spores and milk thus treated will only keep for two or three days unless put on ice.

Biological experiment has demonstrated that the thermal death point of the Ducrey bacillus, the germ of chancroid, is among the lowest, it being destroyed in cultures by the temperature of 122 degrees Fahr., maintained for several minutes.

The following case, illustrating the effect of heat in the

destruction of this germ, enabled me to verify, upon the living subject, the results of laboratory experiment, the conclusions of which have too often proved fallacious. It is, so far as I have been able to ascertain, the first attempt to utilize the low thermal death point of the bacillus as a means of treatment.

W. P., 22 years old, seen January 24, 1907; heredity and general health good. No previous venereal disease. Last coitus Jan. 8. On Jan. 19, he noticed an ulcer in the sulcus on the left side, which was somewhat tender. This increased slowly in size till, two days before he came to consult me, he found that he could not retract the prepuce. The long incubation and the character of the adenopathy in the groins led me to believe the lesion an ulcus durum. I therefore performed circumcision, rather than merely slitting up the dorsum of the prepuce, which would have been the proper course for chancroid.

Upon removing the prepuce, I found that there were three small, soft chancres, less than one-fourth inch in diameter, in the sulcus. I cauterized these with carbolic acid and directed the patient to report the next day if there was any further extension of the sores, if not to return without fail two days later.

He went to his residence outside of the city and did not return until after four days. By this time the sutures had all ulcerated out, the prepuce had retracted and the whole surface of the wound, forming a ring over one half inch in width, surrounding the penis, had been transformed into a phagedenic soft chancre, intensely painful and exuding a large amount of pus. I placed him in a hospital immediately and cauterized the whole surface thoroughly first with carbolic and then with nitric acid.

Upon visiting him the next day, I found that the chancroid had extended one-fourth inch up the pars pendula, discharging still more pus, the penis being considerably swollen and so excruciatingly painful that he had not slept at all. The outlook under any of the ordinary methods of treatment seemed very dubious.

Recalling the low thermal death point of the bacillus of

soft chancre, I decided upon treatment based upon this fact; went to a tinsmith and had an oven constructed with a tube leading from it and ending in a funnel-shaped opening. The oven was provided with an opening in the bottom for the penis, one in the top for a thermometer and a small hole on one side near the bottom to provide for the circulation of air. Without it the temperature could not be raised sufficiently. Heat was provided by a special form of kerosene lamp, used for incubating eggs, which was placed under the funnel. The whole apparatus was covered with two layers of asbestos paper in order both to retain the heat and to avoid burning the patient or the bed clothing.

Upon its completion I returned to the hospital and installed the apparatus, placing the lamp upon a chair beside the bed, so that the burner was within easy reach of the patient's hand. A towel was wound around the base of the penis so that the oven rested upon it and a frame placed above to avoid contact with the bed clothing. The temperature was gradually raised to 136 degrees Fahr., which was not uncomfortable. In a few minutes the pain, which had been intense, had practically ceased. It was then eleven o'clock p. m., and I instructed the patient to keep the temperature between 135 and 140 degrees until my arrival the following day.

I returned at nine a. m., and found that a most remarkable change for the better had occurred. He was in no pain whatever, and the whole surface was practically dry, only a slight oozing of pus being present. A thin, dark crust had formed, the width of the lesion had perceptibly decreased and the swelling had largely subsided. A wet dressing of 1:2500 corrosive sublimate was used while he ate his breakfast and the oven was then again applied. The house surgeon was instructed to see that the lamp was kept in operation fourteen or fifteen hours of the twenty-four, a wet bichloride dressing being applied during the night.

The next day still farther improvement was manifest, there

being only three very small areas of suppuration, under the crust above mentioned, which had become nearly black. This was trimmed away over these areas and the oven reapplied.

The following day suppuration had practically ceased and the day after, the penis being about normal in size and hardly tender on pressure, I interrupted the treatment. The case then made a rapid and satisfactory convalescence, leaving no distortion and but very slight scarring.

I believe that this method will prove a valuable addition to our therapeutic resources in cases of phagedenic chancroid and it would undoubtedly be of equal value in those cases of fulminating phagedenic chancroidal ulceration following bubo, which spread so rapidly and are of such an alarming character.

It would perhaps be necessary for this purpose to use one of the large ovens intended for the whole body, inserting the legs and body well past the limit of the lesion. I believe, however, that a slightly larger oven than mine, constructed without a bottom, the edges being supported by toweling and any vacant spaces below being filled so as to make it practically air tight, would answer the same purpose.

CASE 2. Peter C., Greek, aged 26 years. Coitus July 28, 1908. Sore on dorsum of prepuce Aug. 4th. He states that this healed in thirty days. In the meantime two other sores had started on the dorsum of the glans. He was treated by various physicians until on Nov. 9th he entered a private hospital. The two ulcers had progressed slowly until this time with moderate loss of tissue. While in the hospital the ulcers took on a more phagedenic character and during his three weeks' stay destroyed about one-half of the glans. During the last ten or eleven days in this hospital the patient had very severe hemorrhages daily.

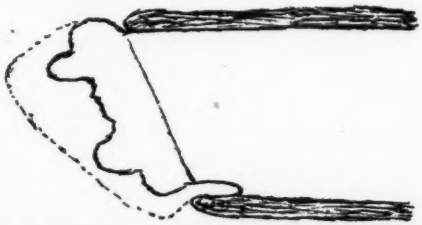
He entered the Rochester City Hospital on December 1, 1908, under the care of another physician who called me in consultation. The accompanying sketch will give some idea of the condition at this time.

PLATE III.—Presented by Dr. E. Wood Ruggles.

As will be seen, nearly the whole surface of the glans had been destroyed and to a considerable depth.

There were two projecting, hornlike masses, one at the right of the meatus being three-eighths of an inch high and nearly a quarter of an inch in diameter, both of which I later tied off with silk ligature.

Smears made from the secretion, at different points of the profusely oozing surface, showed abundant bacteria, consisting of a few Ducrey bacilli and a great number of the ordinary pus cocci. I advised the hot air treatment and the oven was applied the same day. The next day there was very little change except that the oozing was rather less. The day following there was a



CASE 2. Shaded portion represents prepuce and skin. Dotted line represents original outline of glans, solid line that at beginning of treatment.

decided improvement; the ulcerated surface being about one-quarter covered with a crust similar to that mentioned in the first case, except that it was not so dark in color, (probably the lamp had smoked less) but suppuration from the remainder of the lesion was still quite profuse.

I saw him again two days later and there was still further improvement. There had been no hemorrhages since he entered the hospital and the pain which had been severe, had ceased. During the next few days there was continued improvement; there being, however, three or four small surfaces occupying perhaps one quarter of the original area, which still exuded pus. The bacteria disappeared in four days entirely.

At about this time there was an almost complete standstill for two or three weeks. The ulceration did not extend but suppuration continued. The reason for this failure was apparent. The ulceration had extended, before his admission, underneath the retracted prepuce along the groove between the corpora cavernosa, creating a sinus one-fourth of an inch in diameter and one-half of an inch deep. This of course formed a well, constantly filled with pus during the upright position of the penis and both on this account and because of its being covered by the prepuce the hot air did not come in contact with the diseased tissues. I advised the attending physician to slit the overlying skin to the bottom of the sinus in order to give vent to the pus below and expose the sinus to the treatment. This he refused to do. Several days later he did incise the tissues partially, not enough to give relief, however, and there was no infection of the wound. Owing to this, in my judgment, ill-advised conservatism, the treatment had to be carried on for five weeks. At the end of this time he left the hospital with most of the lesion healed and the remainder offering a healthy granulating surface which promptly healed under the use of an aristol-balsam of Peru ointment. The meatus was somewhat contracted, about three-eighths of an inch of it having been eaten away, but most of the corona remained intact. A peculiar feature about this case was the presence of an afternoon temperature 99° to 100.5° practically every day while the oven was in operation; his pulse was 110 on entrance and ranged from 90 to 116, afternoons, during his entire stay. He had four or five moderate hemorrhages while in the hospital but not severe enough to weaken him at all.

CASE 3. George N. F., aged 23 years. Parents living, well. The patient had had infantile paralysis, leaving him with shrunken legs which are not very useful and talipes equinus of the left foot. His chest and arms have been remarkably strong so that he could walk up a flight of stairs on his hands. Gonorrhœa twice. Two years ago had a soft chancre and bubo which had to be lanced.

Last coitus Nov. 15, 1908. Over a month later had a sore on the outer surface of the prepuce which healed in two or three days and then broke down again. After Christmas a swelling appeared in the right groin, increasing in size until about as large as an egg and very painful. This subsided with local treatment. About Jan. 8, 1909 the sore on the prepuce became greatly inflamed and began to destroy this organ. About Jan. 17, ulcers made their appearance, two on the left forearm and one each on the right leg and scalp. These have increased in size, those on the extremities being very painful. He had a severe sore throat during the month of January and lost fourteen pounds in weight. During this whole time he had been under treatment by an advertising quack.

Status præsens, April 10, 1909. Phagedenic chancre of foreskin which has destroyed it entirely except a short tab on the right; the corona and a contiguous area of the glans on the right side have also been eaten away and there is a deep ulcer nearly one-half inch in diameter on the former site of the frenum. This whole area was bathed in pus and exquisitely painful. The inguinal, cervical and elbow glands are considerably enlarged. On the left forearm there is a large oval rupial syphilide about two by one and one-half inches in size. A rupial scab three eighths of an inch thick occupies the central part of the lesion, the remainder being ulcerated. One inch below and anterior from the olecranon process is a similar syphilide about an inch in diameter. On the posterior internal surface of the right calf there is an oval syphilide like that on the forearm but still larger. On the scalp in the middle line, one inch from the forehead, is an absolutely dry rupia about one by five-eighths of an inch in size, which has never ulcerated. This rupia is one-half of an inch high and resembles a cock's comb.

On making a smear from the pus of the chancre, I found several different varieties of germs, in enormous numbers. I could only differentiate the staphylococcus and another coccus which was intracellular. There were apparently no Ducrey bacilli. I unfortunately made no autoinoculation experiments until the oven

treatment had been carried on several hours. The vaccination sites from both the chancre and an ulcerated syphilide remained sterile. (I could find no bacteria in either lesion at this time).

There was no sign of a roseola but he had been put on some specific treatment early, by the quack who had had him in charge.

I thought immediately of the hot air treatment but decided to try out the application of a saturated solution of permanganate of potash, after cleansing with peroxide, a procedure of great antiseptic value in chancroid. Vaseline was applied continuously to the ulcers to remove the rupial crusts.

On April 11th there was very little change in the condition of the chancre, the bacteria being fully as numerous as the day before. I then applied the hot air apparatus. The patient only used it, however, five or six times during the next two days on account of pain in the lesion. This was caused by the bending over of his flaccid penis when in the upright position, thus producing pressure upon the tender, raw surface. There was, however, less oozing of pus and it was sterile, smears showing no germs.

I supported the penis better and told the parents to keep the apparatus in operation at least fourteen hours of each day. In the next twenty-four hours the treatment was carried on during fifteen hours, this time with great improvement. Practically the whole area was dry. There was no oozing of pus except in an area less than one-fourth of an inch in diameter on the dorsum and from the ulcer at the site of the frenum: pus still sterile. An ointment of iodine, belladona, mercury and vaseline was applied to the syphilides.

On April 16th there was very much less pain and tenderness, although the patient was still somewhat annoyed by erections at night. Pus sterile.

I had delayed specific treatment until this time, so that any improvement arising could not justly be attributed thereto. He now began using inunctions of sapolentum hydrarg with iodide of potash internally. The improvement continued until April

20th, i. e., nine days, when, most of the lesions being sealed over, the remainder apparently in a healthy, granulating condition and the width of the area being perceptibly decreased from below, I suspended the hot air treatment and applied an ointment consisting of 6% aristol and 12% balsam of Peru with vaseline. The lesion on the scalp was nearly healed at this time and those on the extremities were considerably improved.

The lesion on the penis not improving, I changed a few days later to a mercury and iodine ointment.

About May 3rd I found the ulceration at the site of the frenum extending upward toward the meatus and cauterized it with the saturated solution of permanganate. At the same time ulceration had begun between the corona and the tab remaining from the prepuce, which extended toward the center of the organ and also upward over the corona upon the glans: this was treated in the same manner.

As the ulcerative process continued to extend, reaching the edge of the meatus, I again applied the oven on May 6th. At this time the surface of these lesions resembled somewhat the description of "Erosive and Gangrenous Balanitis," mentioned by Corbus and Harris in the *Journal A. M. A.*, May 8, 1909, there being little ulceration apparent, in spite of the advancing border and the surface being covered with a grayish white membrane. However, since the patient had been using their specific, hydrogen peroxide, two or three times a day constantly, without result, it is not likely that this was a similar process.

In two days decided improvement was manifest and on May 12th skin had formed upon nearly the whole area of the former ulcer surrounding the penis, leaving only an unhealed band averaging one-fourth of an inch in width. The ulceration, which had extended to the meatus, was practically dry. The deep ulcer between the one remaining part of the prepuce and the corona, however, seemed to be growing deeper, owing probably to the apposition of the parts which prevented the access of the hot air.

The band like lesion healed over rapidly and became cov-

ered with new skin, but the ulcer in the sulcus grew deeper for a few days. On my departure May 28th, however, it had practically healed.

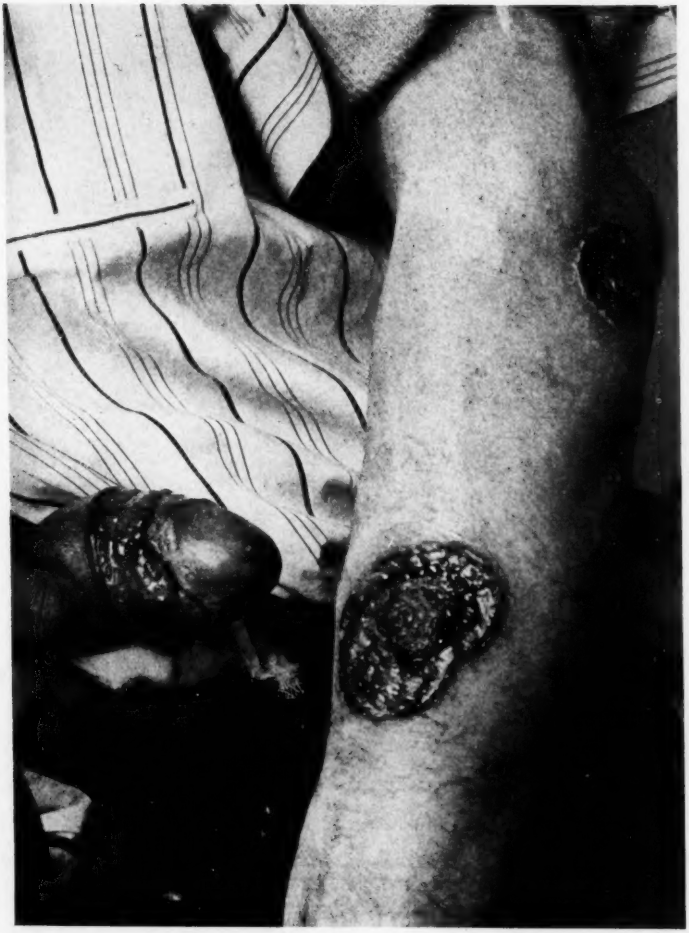
It might appear that the history of this third case nullifies the value of the treatment. After mature consideration I am confident that it presents a strong argument in its favor. So long as the heat was applied the lesions improved. Since the first two cases had rapidly healed when suppuration was at a standstill, I expect this lesion to do likewise. The failure to progress and the recurrence of ulceration were, in my opinion, due to the greatly lowered vital forces and tendency to repair resulting from an insufficiently treated syphilis and the weeks of acute suffering and loss of sleep. When the oven was reapplied the major part of the lesion healed and new skin formed, not scar tissue, in a few days. Profiting by my experience in this case, I should not, in similar cases in the future, discontinue the treatment so early.

From a careful study of the last two cases I am convinced that a large part of the benefit obtained was due to the active hyperæmia produced by the long continued heat. That the effect of artificial hyperæmia upon bacteria is not merely inhibitory but, though raising the local opsonic index, bactericidal also, has been thoroughly established by Bier and other investigators. This must be the explanation of the good effects in these cases, since the secondary pus cocci which predominated in both are not directly killed by the temperature employed, though their resistance may be weakened. This being the case, it becomes probable that the hot air treatment will prove of the greatest value in all phagedenic processes whatever be their nature or origin.

The ordinary ovens for the arms or legs would be applicable for any phagedenic process of the extremities; the trunk could be treated by the bottomless oven above described or by the insertion of the legs and trunks into one of the large ovens, or for that matter by one of the simple Turkish bath cabinets.

The construction of the oven is simple. A closed box is

PLATE IV.—Presented by Dr. E. Wood Ruggles.



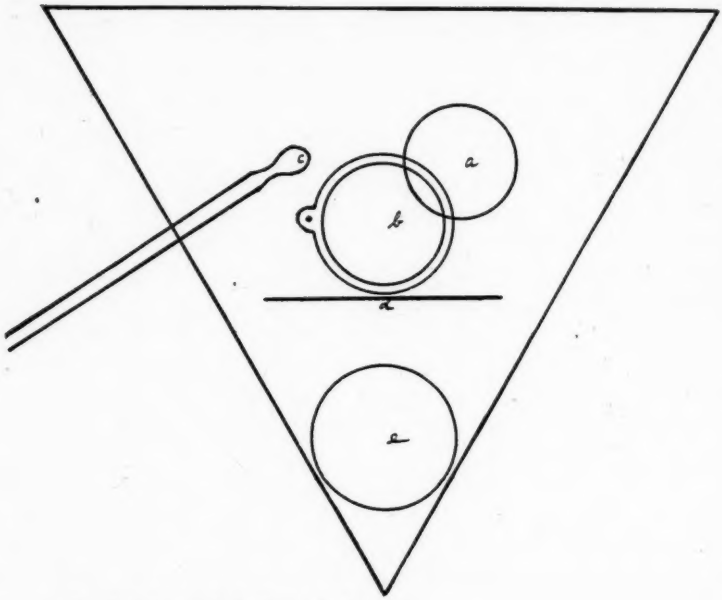
made of galvanized iron, six and one-half inches square, and five and one-fourth inches high. A circular opening two and one-fourth inches in diameter, in the center of the bottom, admits the penis. The aperture for the thermometer, at one of the corners away from the source of heat, is closed by a disk of metal, fitting the thermometer closely. At the opposite side of the distal end, one-half inch from the bottom, is the opening for air, five-eighths inch in diameter.

The fluted, galvanized iron tube, two and one-fourth inches in diameter is soldered to the center of one side, at such an angle that the bottom of the funnel is eight inches below the level of the bottom of the box. This tube is thirteen inches long. An elbow of the same size into its extremity and to the other end of this is soldered a funnel seven inches in diameter at the bottom, and three and one-half inches high. Near the bottom of this funnel, on the right side, is an aperture two and one-half inches in diameter, permitting the patient to regulate the lamp and also providing fresh air. The whole apparatus is covered with two coats of asbestos paper. The lamp is about seven and one-half inches in diameter and two and a half inches high. It has no chimney.

On account of the possible risk of fire in a hospital I have had an oven constructed employing a 32 c. p. frosted incandescent light as the source of heat. This proved a much more difficult problem than the hot air oven. The electric oven is of triangular shape, each side measuring fourteen inches and the inside height is six and one-half inches. The socket for the lamp is attached near one corner of the cover which fits on like an ordinary box cover, without hinges.

A perpendicular shield of tin, about two-thirds as high as the oven, is placed near the bulb to shut off direct radiation from the penis and the thermometer. These are located in the other two corners at points equidistant from the two sides and the shield. The heat is controlled either by a rheostat, or more simply by opening or closing the door of a two and a half inch circular aperture in the cover midway between the bulb and the

opposite side. The thermometer should extend through the side of the oven, so that its bulb may be near the floor. The following horizontal section will make the construction clearer, it being understood to represent three different horizontal planes—the cover at the point "c" as in the other apparatus. It is sold



a. Opening for penis in floor, $2\frac{1}{4}$ in. diam.
b. Opening in cover to control temperature. Its cover turns on rivet at left. $2\frac{1}{2}$ in. diam.
c. Thermometer.
d. Shield. 5 in. long, $4\frac{1}{4}$ in. high.
e. Electric bulb. Socket atttached to cover.

bulb. The edges of cover are bent downward about one-half inch to fit over the box. Asbestos paper is pasted on inside and outside and both sides of the shield.

Since this article was set up and the plate made I have found that a longer thermometer, which will extend nearly to the floor,

is manufactured, which can be inserted through an opening in the cover at the point "c" as in the other apparatus. It is sold under the name "Chemical Thermometer with paper scale."

These ovens are manufactured by the Kny-Scheerer Co., of New York City.

DISCUSSION

Dr. L. Bolton Bangs of New York. This is an interesting addition to our methods of treatment, and I congratulate the reader of the paper upon the fact that it is not all "hot air." But there are one or two questions that suggest themselves to me. It seems to me that in order to test it fully he should eliminate the question of the arrest of the process by his previous cauterization in the first case. Also in our cases recovering from syphilitic lesions we know how much effect is produced by quiet and rest, and possibly in this case by the administration of specifics, which he assumes had been given to the man before he came under his care.

Dr. G. K. Swinburne of New York. This certainly is a very valuable addition to the treatment of these lesions, because, while in the great majority of cases the treatment is very simple and they most frequently recover by simple measures, every once in a while we get a case that defies everything. I had one case, not of phagedena, which is a rapidly spreading sore, but of a constantly persistent eating away of the corona into the urethra, the case having been in the hands of another physician. He came to me on account of his great pain, and, after using various remedies, I found that equal parts of of 50% argyrol sol. and ichthyol stopped the process in this particular case entirely. It had been going on, however, for eleven months. I am sure that if at an earlier period this method had been taken up it would have prevented its continuance.

Dr. Ruggles in closing. With regard to Dr. Bangs' question as to the cauterization of the first case having arrested the process, I can only say that it did not exert the slightest influence. The ulceration progressed steadily up the pendulous portion till the oven was applied. The cauterization in the third case also appeared to make no change. The bacteria were just as abundant the next day after it was done, and I also applied cauterization when the ulceration began again, after the removal of the oven, with absolutely no effect. As soon as the oven treatment was again applied an attempt at repair began immediately.

In regard to the beneficial effects of anti-syphilitic treatment account-

ing for the improvement in the last case, I will say that I omitted antisyphilitic treatment for six days. This was stated in my paper, but was not read for lack of time. This radical change for the better, had taken place two or three days before I started him on specific treatment.

TREATMENT OF STRICTURE OF THE BULBAR PORTION OF THE URETHRA BY RESECTION PARTIAL OR COMPLETE

By HUGH CABOT, M. D., of Boston.

THE class of cases here to be considered is that to which external urethrotomy or perineal section with or without a guide has been ordinarily applied. That such a group of cases exists no one familiar with clinics of the large metropolitan hospitals will question. That by improved methods of checking the original infection and by more intelligent care of the stricture when it begins to form this operation might be avoided is not to be denied, but the fact remains that many cases present themselves in which the stricture is either for the time being impassable, or in which contraction has gone on to such an extent that gradual dilatation will not effect a cure. Moreover, experience does not warrant the belief that this type of patient will follow up treatment with sufficient persistency to make cure or even palliation by gradual dilatation an outcome at all to be expected. It is common knowledge that these patients will not for a period of years pay attention to the condition of their urethra and we are therefore at liberty to assume without further discussion that we shall at least for some time to come be confronted with these strictures of the bulbar portion of the urethra requiring some form of operative treatment.

To this class of cases external urethrotomy has generally been regarded as best suited and though internal urethrotomy has had its advocates and divulsion has claimed its victims, neither of these operations need be seriously considered as a cure for stricture of this portion of the canal.

Has external urethrotomy proved a satisfactory method

of treatment? Clearly it has not. It temporarily relieves the condition, for a short time restores the calibre of the urethra and prepares the way for treatment by gradual dilatation, but as has already been suggested gradual dilatation will not cure these patients in the time which they can be expected to devote to it and it remains a fact that recontraction and subsequent reoperation have been a frequent result. The reasons for the failure of the operation are fundamental, for it does not attack the cause of the contraction but only treats one of its results, namely, narrowing. The fundamental cause of the difficulty lies, of course, in the scar tissue in the periurethral structures. Upon these, external urethrotomy has no effect and in fact it tends to increase rather than diminish the total amount of scar. In ordinary cases after the stricture has been divided there remains a narrow band of the mucous membrane on the roof and whether the bladder is drained with a perineal tube or an inlying catheter, whether the overlying tissues be sutured or the wound left wide open the calibre of the urethra is restored not by mucous membrane, not by the urethra itself, but by scar tissue, which if carefully treated may become covered with mucous membrane but which can never replace the distensible, elastic tissue of the corpus spongiosum. It must, I think, be generally admitted that the net result of external urethrotomy is an increase not a diminution in the amount of scar tissue. In short, the operation makes no attempt at curing the condition and must be regarded as purely palliative. If this operation is to be accepted as satisfactory, or the best that can be achieved under the circumstances, it amounts to admitting that cure, as the word is ordinarily used, cannot be obtained and is not even attempted. This position does not seem to me tenable in the present day when the limits of surgery are being rapidly extended and nothing short of permanent cure is accepted as satisfactory. In a word, it seems to me that the treatment of these strictures by external urethrotomy is an admission of weakness which ought not at this time to be necessary.

On the other hand is there no reasonable probability that any other method will give some more satisfactory results?

Clearly the object to be attained is the removal of all scar tissue so placed that it can constrict the urethra and the restoration of the canal by some method which avoids the probability of recontraction. The first requisite is simple enough; the removal of the scar tissue presents no difficulty. It is the restoration of the canal that is the real crux of the matter.

For this restoration two chief methods have been utilized, resection and suture and more recently fistulization with subsequent closure of the opening by a plastic operation if necessary. The method of fistulization has recently been advocated with great ability in a paper by Pasteau and Iselin. Their work is devoted principally to traumatic stricture and seems to show that the calibre of the canal can be restored and maintained by this method. On the other hand the objections to the operation are obvious. It leaves the patient with a perineal fistula for weeks or even months and with some cases at least involves a second operation. As has already been noted it is by no means easy to keep these patients under observation and it is quite essential to success that the case should remain under the care of the surgeon who does the first operation. If it can be shown that restoration of the canal can be obtained in no other way, then and, as I think, not until then, is it to be regarded as the operation of election.

Resection of the Urethra. As long ago as 1836 Dugas, an American, resected the urethra for stricture. Since that time the operation has been more or less constantly in use, but has been regarded as particularly applicable to traumatic stricture, more rarely to inflammatory and has frequently given unsatisfactory results. The three methods which have been most frequently employed are: (1) Complete division of the urethra with removal of the strictured portion, the ends of the urethra being left free and the gap allowed to close by granulation over an inlying catheter. (2) Complete resection of the stricture with immediate suture of the ends, the bladder being drained with an inlying catheter. (3) Partial resection. By this method a band of mucous membrane is left upon the roof of the canal to pre-

PLATE V.—Presented by Dr. Hugh Cabot.

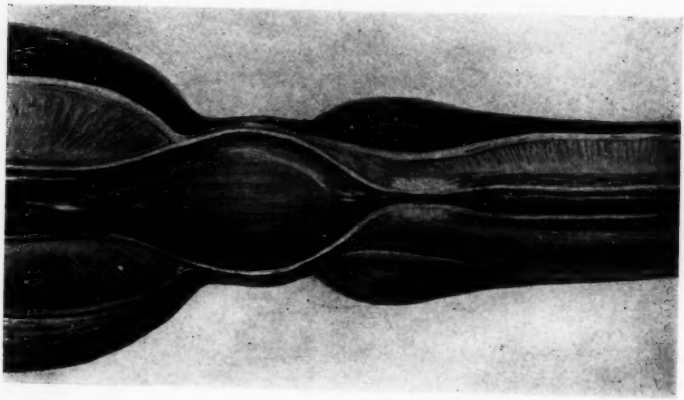


Fig. 1.

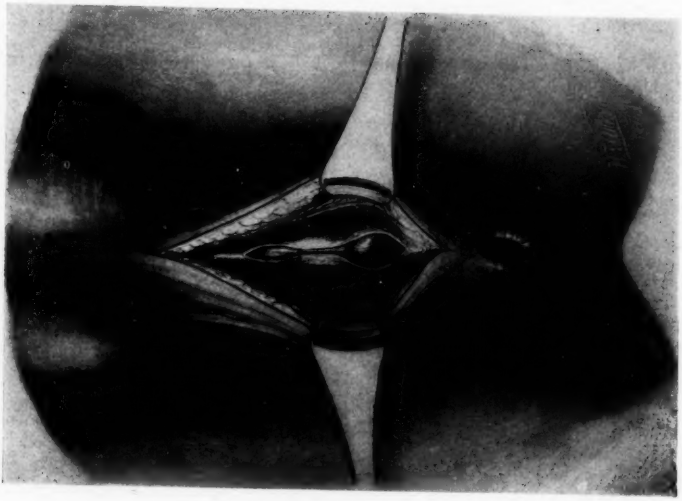


Fig. 2.

vent retraction of the divided ends. The gap thus left is united so as to leave a transverse wound and has some of the characteristics of the so-called Heinecke-Mikulicz pyloroplasty. The results of these operations have not been wholly satisfactory. Pasteau and Iselin studied thirty-five cases collected from literature in which the operation had been applied to traumatic stricture. They found that in most cases the reports had been made so soon after the operation that no sound idea of the permanent result could be obtained. Only a few of the cases were known to have maintained their calibre for a term of years. It was in fact the unsatisfactory character of the results which led them to search for a more successful method.

The failure has apparently been due to three causes,—undue tension at the point of suture so that the divided ends ultimately pulled part leaving a wide band of scar; slight infiltration of urine which has been almost unavoidable and which results in excessive scar formation; and wound infection. The entire avoidance of wound infection has been practically impossible as the urethra is habitually the habitat of bacteria which the presence of an inlying catheter rouses into activity. The degree of infection need not be great and it has generally been possible to avoid gross wound infection. But even the more moderate degrees such as necessarily result from the urethritis which accompanies an inlying catheter have been sufficient to greatly impair the results. The method which I am about to discuss seems to me to avoid these dangers and result in restoration of the canal in such a way as to give considerable hope of its maintaining its calibre.

Technique of Resection of the Urethra. If this operation is to be successful it must avoid the objections to the operation as ordinarily done.

Prevention of Tension. The entire avoidance of tension at the point of suture is probably the most important requirement. This can be secured if the urethra be sufficiently mobilized. It is the rule behind strictures of small calibre to find some and often considerable dilatation of the urethra and the slack thus

provided makes it unnecessary to mobilize the posterior segment. (Plate V, Fig. 1.) The anterior segment should be mobilized to an extent sufficient to allow suture entirely without tension. I have been, on the whole, surprised to find how much the corpus spongiosum could be freed from the surrounding tissues without impairment of its nutrition. In one case it was freed as far forward as the peno-scrotal angle without bad results. I believe it to be important to mobilize the whole corpus spongiosum and not simply the urethra itself, as in this way the tendency to retraction is diminished.

Avoidance of Urinary Infiltration. Clearly the avoidance of urinary infiltration even of a slight amount is of paramount importance. This has ordinarily been guarded against by drainage with either an inlying catheter or a tube brought out through the wound. Both of these methods are somewhat objectionable. It is claimed, and with some justice, that even with a catheter in the urethra some urine escapes alongside of it, especially when there is much dilatation of the posterior segment. The other method, which drains through the wound, is even more objectionable for it does not avoid infiltration by urine escaping alongside of the catheter and when the catheter is removed the urine is passed directly through the fistula, causing irritation and increase of scar tissue. In order to entirely avoid contact of urine with the wound until the scar has completely formed, the urethra should be drained behind the point of suture and this can readily be done by opening the membraneous urethra behind the stricture by a small boutonnière and draining the bladder with a catheter inserted at this point.

Avoidance of Infection. It is not necessary to consider here the avoidance of the more gross forms of infection; it is with the more apparent trivial kinds that we are chiefly concerned. The most fruitful source has been the presence of the inlying catheter with its accompanying urethritis. This urethritis while comparatively unimportant in a healthy urethra undoubtedly tends to increase the infiltration and scar formation at the point of suture

PLATE VI.—Presented by Dr. Hugh Cabot.

Fig. 3.

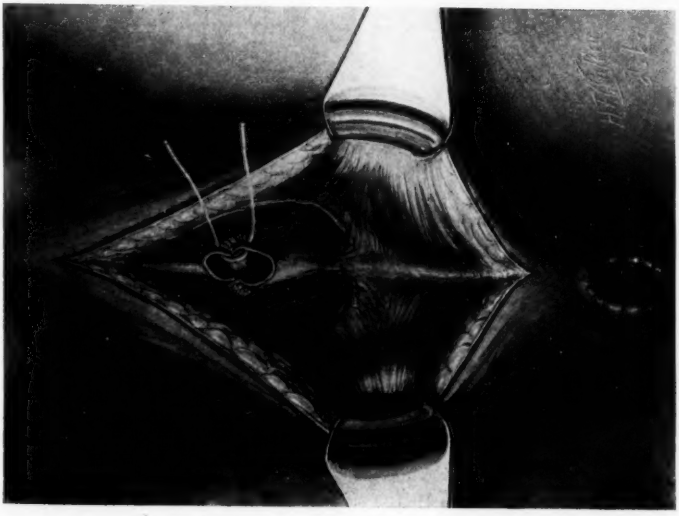


Fig. 4.

and may be a considerable element in the production of excessive scar. This can be avoided by drainage of the urethra behind the stricture as above suggested. The urethritis is very slight and can reach the wound only by direct extension along the urethra. This may be avoided by careful treatment of the anterior urethra during the process of healing. It has been our custom to wash out the anterior urethra two or three times a day. For this purpose we have used boracic acid and more recently argyrol and it is clear to me that benefit has resulted, though I am not clear that the particular solution used is of essential importance. In this way by drainage behind the point of suture and by frequent cleansing of the anterior urethra the wound can be made to heal rapidly and infection is minimized.

Details of the Operation. It is not intended to claim originality for this procedure. It is a combination of methods used by other operators with such personal modifications as have seemed desirable.

Where it is possible the mucous membrane of the roof of the canal should not be destroyed and the ends of the urethra will thus be prevented from retracting excessively. In the worst cases where the urethra has been practically destroyed complete transverse division may be necessary. In many of the inflammatory strictures, however, it is possible to leave this strip on the roof which does not in any way interfere with the free mobilization of the anterior segment. For convenience of description the steps of the operation will be given in order.

1. With the patient in lithotomy position a free median incision is made down to the urethra, dividing the structures of the bulb in the median line and turning them aside. It is important that this incision should be carried well backward so that the membraneous urethra can be exposed.

2. The stricture is then divided by a longitudinal incision upon a guide, if one has been passed, without a guide if its insertion has been impossible. The whole incision should be about one and one-half inches in length. The condition at the point

of stricture is then examined. All excess of scar tissue removed, the whole strictured portion excised if necessary and hemostasis obtained. (Plate V, Fig. 2.)

3. The anterior segment of the urethra is then freely mobilized by separating the corpus spongiosum from its attachments until it can be joined to the posterior segment without tension. Upon this part of the operation particular stress is laid.

4. Suture. If it has been necessary to completely divide the urethra, suturing should be begun upon the roof, the sutures being passed from without inward including all the structures of the corpus spongiosum and the urethra. We have generally used number o chromicized catgut and a fine full curved needle. Where it has been possible to leave the roof of the canal intact suturing is begun at the sides in such a way that the longitudinal incision in the urethra is brought together transversely, somewhat after the method of a pyloroplasty. (Plate VI, Figs. 3 and 4). After about one-third of the circumference of the canal has been sutured a No. 28 sound is passed into the urethra and the suture is completed about this so as to be sure that the canal is given full calibre. As the dilated urethra behind the stricture generally yields more readily than the anterior segment, the line of ture will be found at the end of the operation to occupy a position further forward than the original stricture. The last suture closing the wound unites the two extremities of the longitudinal incision in the urethra, and by lengthening this incision the calibre can be increased to any reasonable extent.

5. The suture having been completed the urethra is opened upon the sound at a point as far behind the stricture as possible. This opening should be small, just sufficient to admit a No. 12 soft rubber catheter, which is passed to the bladder and left in position. (Plate VII).

6. The wound is then sutured in layers bringing together the muscular structures of the bulb as accurately as possible with interrupted sutures and the skin is closed except for a point at the lower angle through which the catheter is brought out. When the closure of the wound is complete, the patient is placed in a

PLATE VII.—Presented by Dr. Hugh Cabot.

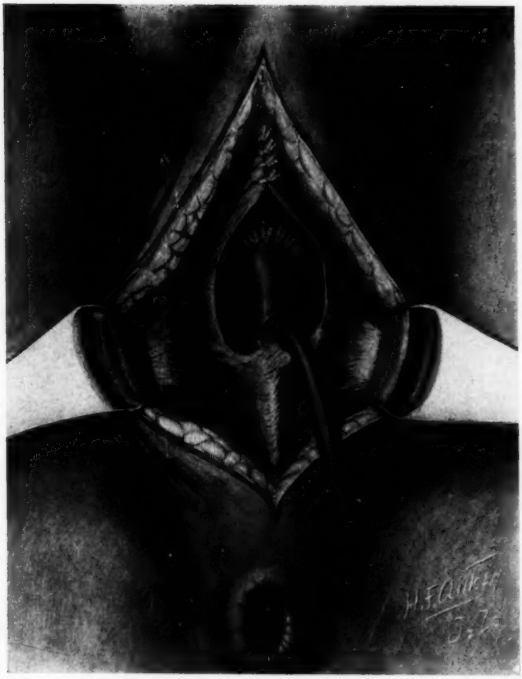


Fig. 5.

horizontal position, the catheter is adjusted at the proper point and is then fastened in position by a suture in the skin.

After Treatment. The important points in the after treatment are the care of the anterior urethra and the retention of the catheter until the wound is completely healed. The care of the anterior urethra has been described above and the essential thing is that the urethra should be kept entirely clean with some solution which will not produce undue irritation and by some method which will not traumatize the suture. It has seemed to us that injection with a small syringe is preferable to irrigation either with a catheter or with a reservoir and nozzle.

The catheter should be left in position for from ten to fourteen days. In one case we removed it at the end of a week and slight leakage occurred at the point of suture. In the more recent cases it has been retained for two weeks and no leakage has taken place. The perineal boutonnière closes as a rule in two or three days after withdrawal of the catheter. No instrument should be passed through the stricture until complete healing has taken place which will be during the third week.

Cases to Which the Operation is Suited. Resection is applicable to all strictures of the bulbo-membranous portion of the urethra not amenable to gradual dilatation and not complicated by infiltration of urine or fistulæ. It is thus applicable to a considerable group of cases both of traumatic and inflammatory origin.

Since healing practically by first intention is essential it cannot safely be employed while the inflammatory process is active or in some cases of traumatic rupture of the urethra with extensive tissue destruction. It may more properly be used in the less severe cases of traumatic rupture in which the posterior wall is still intact, tissue destruction is not great and which are seen before infiltration of urine has begun.

To the more severe traumatic rupture of the urethra and for inflammatory strictures complicated by infiltration of urine or fistulæ, the operation of fistulization as described by Pasteau and Iselin is better suited.

We have done the operation of resection more or less as above outlined in twelve cases during the last eighteen months. In none of them has the time elapsed been sufficient to warrant any conclusions as to the ultimate result and they will not therefore be reported now.

DISCUSSION

DR. L. BOLTON BANGS of New York. May I ask one question? It occurs to me because of some results that have followed operations upon that portion of the urethra heretofore. I should like to ask whether in the course of time there has been any shortening of the corpus spongiosum so that on erection there is curvature?

DR. ROBERT H. GREENE of New York. I should like to inquire whether when he makes his boutonnière and introduces his catheter he sews the wound up tightly around the catheter?

DR. CABOT in closing . As to the question asked by Dr. Bangs, I have no direct knowledge of it. I have not seen it in any of the cases, and I have succeeded in getting all the cases back for examination within the last two or three weeks. One of them was perhaps unwise enough to get himself committed to State's prison where I can observe him continually during the next thirty years.

I reply to Dr. Greene, the opening in the urethra is made small so that the catheter fits tightly and the wound is closed tightly around it, so that it fits perfectly snugly.

SUPRAPUBIC PROSTATECTOMIES

By CHARLES H. CHETWOOD, M. D., of New York.

IT is not my intention to inflict upon you a recital of long clinical histories, nor yet to report a series of operations with a view of minimizing the risk of prostatectomy, an operation most often performed at the time of life when the vital forces are on the decline, when serious changes have already occurred in the local and general circulation, that has to be performed on parts which are continually bathed in urine, and when the organs, affected directly or indirectly by the operation, have lost already

some of their functional capacity. Confronted with a situation of this sort, we cannot look with indifference upon the hazard of prostatectomy.

It seems to me that we have heard little of late, before this Association, of suprapubic prostatectomy, and that it has received less attention, perhaps, than this mode of procedure is entitled to receive.

If I read aright the temper of the surgical mind to-day, we no longer recognize different camps in prostatic surgery,—viz.: the perineal prostatectomist and the suprapubic prostatectomist; but an understanding has developed between these disputing factions, and it is generally acknowledged that, as there are different kinds of prostatic enlargements—broadly speaking, those that are high up and those that are low down—so there are cases best suited to the perineal and also those best suited to the high operation; while there are borderland cases, which are as well attacked by either one of these routes.

The statistics prepared by Watson, and appearing in the recent treatise of Watson and Cunningham, would seem to show a better percentage of complete recoveries following the suprapubic operation as compared with the perineal route; while the percentage of operative risk favors the selection of the perineal operation. Yet a progressive decrease in mortality is apparent in both instances, and up to now the perineal technic has seemingly received much greater attention than the high operation. I am inclined to believe that the future will develop the latter operation to a considerable extent. As it is true, and is clearly set forth by Watson, that the suprapubic is a complete operation, having a large percentage of cures, and a small percentage of operative complications, is rapid of performance, under conditions which afford free access to the gland, it is a matter of serious importance that effort should be made to improve the technic and bring down the mortality rate.

This communication is devoted to the consideration of six cases of suprapubic prostatectomy, representative of different phases of the subject, operated upon in the last six months, ex-

cept one of them, which was operated upon before the last summer holidays.

The patients are aged 70, 72, 60, 75 and 60 years respectively. Duration from 1 to 20 years.

Urination. Complete retention in 3; frequent and difficult in the remainder.

Pain. Present in a greater or lesser degree in all cases.

Infection had occurred in all of them, with one exception; that is to say, the urine was cloudy and bacterial, and in 3 there was ammoniacal decomposition.

Urethral Length varied from $8\frac{1}{2}$ to $9\frac{3}{4}$ inches.

Rectal Examination. The prostates, as felt from this point of observation, varied in size from that of a slight enlargement to five times the normal dimensions.

Bladder Exploration possible in all but one case; and it was possible to recognize with the sound an intravesical median projection.

Examination of the Urine showed moderate implication of the kidneys in about half the cases.

Other Complications Existing. Stone in one case, glycosuria in one case, carcinoma in one case and one patient suffered from extreme obesity.

Operation was preliminary in all cases, with one exception, in which it was performed secondarily to a previous perineal prostatectomy. The operation was done in two steps in one case, on account of the unsatisfactory general condition, very foul urine and most prostatic congestion.

Size of prostates removed shown in the specimens presented.

Convalescence was prompt and uninterrupted in all except one case, in which it was protracted.

Latest Report following operation varies from one to 13 months.

Result has been return of voluntary urination in all cases; elongation of interval between the urination from complete retention and 15 minutes to one hour frequency before, to a minimum of 2 hours and a maximum of 6 hours following operation.

Urine has become clear in three cases, and remains cloudy, but not decomposed in three.

Swollen testicle has occurred in three cases following operation; in all of these cases there was a history of previous trouble in the testicle. In one case active epididymitis occurred before operation, a double vasectomy was performed and no relapse occurred after the prostatectomy. In the other cases there had been no previous trouble with the testicles, and none occurred after prostatectomy.

The operative technic followed is practically the same in all cases, and not different from that inaugurated by our honored colleague and fellow-member of this Association, Dr. Belfield. Special attention is given to certain details to facilitate the operation, shorten its duration and enable the hastening of post-operative convalescence. Of the last consideration, the most important is that of bladder drainage.

The patient is brought to the operation room with the bladder washed. The anæsthetic used has been in most instances ethyl chloride and the drop ether method. The bladder is emptied and while the catheter is left in place the patient is immediately put into the Trendelenburg position. Incision is made above the pubis about three inches in length, separating the muscles and exposing the pre-vesical fat. An assistant now inflates the bladder with air, while the wound is separated by retractors. The structures overlying the bladder are stripped upwards to the upper extremity of the wound with a piece of gauze. Incision is now made through the bladder, running well downwards. This incision may be enlarged later, after the exploration has been completed with the finger.

Exploration with the finger is usually sufficient to give an adequate idea of the prostatic growth, but retractors may be inserted and ocular observation made if desired. The nature of the prostatic growth is investigated by palpation, and in the one case of cancer in this series, it was recognized at the time of operation.

A place is selected for the incision of the mucosa over the

prostatic growth, which is usually to one side of the median line at a point where the lateral and median growths meet. Into this incision the bare finger is inserted, and by gentle manipulation it is ascertained that a good line of cleavage is obtained. Separation of the prostatic growth is then accomplished with the aid of the gloved finger of the other hand in the rectum.

As to the all-important matter of drainage, I have for two years past been using a double tube, one large and one small for continuous irrigation, which in the first 24 to 48 hours is an important feature, to prevent blood clotting inside the bladder.

When in Europe this past year I found that in Paris the surgeons were using a similar double current tube, designed by Dr. Marion, which did not differ in principle from those that I had been using for some time previous. They resemble the Freyer tube in their unusually large size with a small catheter-like tube attached. The extra large size is intended to permit free evacuation and prevent retention of clots. Freyer uses an extraordinarily large tube without any irrigating attachment. I have found of late months that drainage is just as good with the irrigating attachment when a smaller tube is used, which allows the insertion of two or three stitches to close up the bladder so much more that shortening of the convalescent period is the result.

The size of tube used is about $\frac{5}{8}$ of an inch in diameter, with a small catheter attachment; besides this, however, I invariably use an indwelling catheter in the urethra, both because it is useful to irrigate through, should the other attachment become clogged, and because it smooths the newly forming posterior urethra during cicatrization, and is already in place for use after the bladder tube is removed, thus avoiding the unnecessary bruising of the tissues which sometimes occurs upon the first introduction of a catheter after operation.

The prime object of good drainage is to keep the bladder clot-free and the patient comfortable during the first few days. I find that the method described adequately fulfils these conditions. It is at the period when the suprapubic tube becomes some-

what loose that we have experienced difficulty in keeping the urine from overflowing alongside. Various systems of siphonage have been adopted, but have not proved successful. I have adapted the system of siphonage designed many years ago, and have constructed an apparatus which is not continually getting out of order and keeps the patient perfectly dry. This apparatus consists of an irrigator jar which empties at slow speed into a tip cup; this latter overflows at regulated intervals into a funnel and thus provides an intermittent siphonage of the bladder.

The period when it is most difficult to keep the patient dry and comfortable is that between the time when the suprapubic tube is taken out and before the suprapubic fistula is sufficiently healed to permit voluntary urination. During this period I utilize the indwelling catheter in the urethra, strapping the suprapubic wound over tightly with adhesive straps, which stage is reached in a much shorter period when the drainage opening left at the time of operation is comparatively small, the tissues not lacerated, and early granulation encouraged by keeping the wound comparatively clean and dry by means of satisfactory drainage provision. The catheter is kept in place from four to five days to a week, and then voluntary urination occurs with moderate leakage.

In one of the cases of the series reported fistula remained for a number of months, but this was on account of deterioration in general health and the great obesity of the patient. Ultimately satisfactory closure occurred.

These cases, briefly enumerated, are as follows:

CASE 1. April 1, 1908, age 70; duration 20 years. Complete retention. Very large prostate, much congested. Urine excessively purulent and foul. Both rectal touch and bladder exploration recognize good sized median intravesical projection.

General condition much depreciated on account of extreme obesity, diabetes and general toxemic debility.

Operation done in two steps. Primary suprapubic drainage, at which time two calculi were removed, and 10 days later com-

plete prostatectomy when the patient's general condition showed marked improvement and as a result the removal of what was an extensive growth caused the patient little or no surgical shock.

Post-operative convalescence was long on account of slow healing of wound, due to great obesity. Fistula persisted for several months but eventually healed entirely.

Intercurrent epididymitis which suppurated.

Present condition. Urinates four to six hours.

Bladder empties.

General health excellent.

Sugar has entirely disappeared from urine.

Remarks on Case 1. This case is an example of advanced prostatic hypertrophy producing complete retention; bad general condition due to toxemia, great obesity and glycosuria, and illustrates the conservative effect of a preliminary drainage as a preparatory measure for both general and local conditions.

CASE 2. Nov. 29, 1908; age 72. This patient has been getting up at night to urinate once or more often for a week, and in the past six months the frequency has become markedly worse, and at times urination was as frequent as every quarter to one hour, and at night six times. No instrument was passed until three weeks ago, when eight ounces of residuum were obtained. Never passed blood spontaneously. Urine clear and sparkling. The prostate per rectum is as large as a golf ball, and of unusual hardness. Patient has lost six pounds in weight.

December 1, 1908. Suprapubic prostatectomy performed. Prostate enucleated without difficulty from a rather thickened capsule, a piece of which is also removed for laboratory examination. Patient makes good recovery. Leaves the hospital and returns to his home in South Carolina, about three weeks after operation. The laboratory report shows carcinomatous foci throughout the gland; but the capsule proved to be simple inflammation and contained no signs of neoplasm. Patient states, 4½ months after operation, improvement in general health, and condition has remained satisfactory so far as his own or his attendant doctor's observation is able to determine.

Remarks on Case 2. The suprapubic operation in this case permitted thorough inspection of the vesical cavity and complete removal of the gland, without disturbing the bladder function. Whether a more extensive operation would afford a greater immunity from recurrence is a question.

CASE 3. Age 60. Patient's history dates back four years, when he begins to have frequency and urgency of urination, following an exposure and cold, when he had his first attack of complete retention. The frequency and urgency of urination, gradually became worse until the demand was almost constant. Two years ago this condition reached its most acute stage, when the patient was able to urinate but a teaspoonful at a time, and compelled to sit down to accomplish this much. At this time he entered one of the large city hospitals for relief, and a transcript of the history shows that he was operated upon in April, 1907. A description of the operation states that through a V-shaped incision, the bulbo-urethra was reached and an opening made into the median portion upon a staff, the capsule of the prostate exposed, a prostatic retractor introduced through the opening in the membranous urethra, and through incisions made in the capsules on both sides of the prostate, ½ inch from the median line. Prostate was removed in three pieces.

In April, 1909, this patient appeared at the Polyclinic Hospital with almost complete retention of urine, great difficulty of urination, and it was not possible to introduce a Nélaton or woven silk catheter. A metallic catheter was introduced with some difficulty. The finger introduced into the rectum felt, with the sound on the floor of the bladder, what seemed to be a prostatic growth of a size much beyond the normal.

Urethral length, nine inches.

In the early part of March of this year the patient was subjected to suprapubic prostatectomy and a large symmetrical growth removed, including the posterior section of the prostatic urethra.

Patient made a good recovery.

Wound healed readily and voluntary urination returned. A

certain amount of dribbling, however, has persisted between the urinary acts.

Remarks on Case 3. This case illustrates the ineffectual result of an attempt at complete removal of the prostate by a deliberate and, from the description, carefully performed perineal operation. On account of a remaining middle lobe, of large size, producing complete retention, a secondary operation was necessary, and the large intravesical projection was readily removed by a suprapubic operation which was evidently not found accessible at the perineal operation.

CASE 4. October 4, 1908; aged 60. Complete retention of a few days' duration, following upon more or less acute irritability of bladder for several weeks back, when he thought he contracted an acute gonorrhœa; before this there was nocturnal frequency. A previous gonorrhœa two years before, but no previous retention.

Prostate per rectum 2½ inches in diameter, generally symmetrical.

Operation. Prostate removed by enucleation in one piece through incision in the vesical mucosa.

Patient up in the ward in two weeks, and made an excellent recovery without post-operative complications.

Bladder emptying completely and the urine coming clear.

Remarks on Case 4. This was a borderline case, that might have been done as well by either perineal or suprapubic route. The result could hardly be improved upon.

CASE 5. February, 1909; aged 75. Complete retention day previous to admission. Symptoms of prostatitis of seven years' duration.

Two previous attacks of retention two and seven years ago.

Prostate per rectum four inches in diameter and feels globular and firm. Extends upwards centrally.

Urethral length, 10 inches.

Exploration with sound detects a median obstruction.

Operation. Complete removal of prostate is effected suprapubically without difficulty. Continuous drainage is provided in the usual way.

Suprapubic drainage for 10 days, following which change is made to an indwelling catheter, which is retained for about two weeks, during which time the suprapubic sinus heals, and voluntary urination and complete emptying of the bladder is satisfactorily accomplished.

CASE 6. Age 60. This patient's symptoms had existed for 1½ years, during which period he has had increasing difficulty in passing water, and greater urgency and nocturnal urination.

November 30, 1908, he had almost complete retention of urine, being able to pass but one or two ounces without the use of a catheter, and in the spring of this year he became practically entirely dependent upon the use of a catheter.

Urine cloudy, but not decomposed.

Urethral length, 9½ inches.

Rectal examination showed symmetrically enlarged prostate, extending backward beyond reach.

Bladder exploration finds resistance upon the floor, as of a middle lobe.

Kidneys not affected.

Patient has constantly recurring swollen testicle, and on this account was primarily subjected to a double vasectomy, which afforded complete relief.

Operation. April 30, 1909. Suprapubic prostatectomy.

Prostate removed in three portions. The middle lobe, which showed a symmetrical enlargement, imposed upon the urethral orifice and two other symmetrical bodies from the lateral region.

Patient had no untoward symptoms. Was sitting up out of bed in a week, and in about 10 days the drainage tubes were removed and the indwelling catheter effectually drained the bladder, there being only slight moisture at the site of the suprabubic wound.

At the end of the second week the catheter is removed and the patient is able to urinate voluntarily, emptying the bladder, and the wound sinus is practically closed.

Remarks on Cases 5 and 6. These last cases illustrate simple, straight-forward suprapubic prostatectomies, presenting ideal results and the accomplishment of satisfactory drainage by means

of irrigation and siphonage with a moderate sized tube, permitting drainage of the bladder walls and a small drainage opening, which, combined with the use of a retained catheter, were the means of producing a short and comfortable convalescence and an early return to voluntary urination.

DISCUSSION

DR. J. R. HAYDEN of New York. I should like to ask Dr. Chetwood the size of the urethral tube he employs and how long it is left in place.

DR. FRANCIS S. WATSON of Boston. With regard to the time occupied in the operation of prostatectomy it would seem to be of much importance to shorten it so far as possible, and yet, as a matter of fact, the lowest operative mortality percentages have occurred in the hands of some of the surgeons who do not employ the most rapid methods of operating, so that within reasonable limits, the time per se which is occupied in doing the operation would not seem to be so essential a factor as one would assume it to be.

With reference to the question of continuous irrigation of the bladder for the purpose of averting sepsis, I would say that I have found it to be quite unnecessary. I have never had a death from sepsis in connection with prostatectomy, despite the fact that I have never used continuous irrigation; it does not, therefore, seem to me to be an important factor in the post-operative treatment of these cases.

I was glad that Dr. Chetwood referred to the desirability of nonpartisan view of the operations of prostatectomy, for it is the doctrine I have preached for the past twenty years, although I have always maintained that except for the very far reaching and extensive intravesical growths, the perineal operations were preferable to the suprapubic simply because the mortality attending them is less, and continues to be less than that of the suprapubic operation whether the calculation be made from the recorded cases of the most successful individual operators, or from a general average of a number of operators. For the special class of enlarged prostates that I have mentioned, I prefer the suprapubic route.

DR. E. E. KING of Toronto. I have had only a limited experience in prostatectomy, thirty-five cases up to the present time. I believe that fully ninety-five per cent. are more amenable to suprapubic than to perineal prostatectomy. I believe that conservative haste during the operation is

certainly an important factor in the recovery of these cases. Since the first of this year I have done seven cases, under gas, gas and oxygen or gas and ether anæsthetics. I have a photograph of the prostate in the last case here. It is one of those cases which I think, without doubt, could not be removed successfully by the perineal route. I was unable to make a satisfactory cystoscopic examination of this case, on account of the great projection of the middle lobe into the bladder. I do not think there is any necessity of the operation occupying more than ten minutes in most of these cases in which you can get your line of cleavage. As you are all well aware, the small prostates are more difficult to remove than the large ones. In those cases in which the kidneys are bad I think the anesthetic is a very important factor in the mortality.

I remember distinctly hearing Dr. Watson give that admirable paper in 1888, and have always felt that the suprapubic route was the route of election.

I am sorry I missed a portion of the paper in reference to the drainage. I now use a seven-eighth inch tube in all cases, although for a time I used a double one-half inch in caliber, alternately closing first one and then the other. On only one occasion did the tubes become plugged by a clot. I have never kept the catheter in for the purpose of continuous irrigation, fearing that it might be a source of infection, and I did not consider that it would be a great advantage in the forming of a new urethra in the portion where it had been interfered with by the removal of the prostate.

In several cases I did the operation in two steps, and I believe that to be a great advantage where you can drain the bladder and get the patient into a better condition of health, and subsequently complete the operation by the removal of the gland.

Dr. C. L. Gibson of New York. Eleven years ago I believed, as most of us did, that the suprapubic route, which brought the gland within better reach of the eye, was the better route, but owing to the considerable mortality I looked around for improved methods. Then the next method was to do a wide perineal dissection, using a small opening above through which to introduce the finger and press down upon the prostate. Still my results were not very good. Finally I adopted, some six or seven years ago, the route which is ordinarily known as the intra-urethral route, in which the dissection is made in the urethra. Since that time I have not had an operative death. I have had two deaths, one occurring a month after the operation from a stroke of apoplexy, and one two months sub-

sequent to operation. Now the demeanor of these patients after this operation, done quickly, is something remarkable. You come around the next day and find these old fellows sitting up in bed, perfectly happy, comfortable, no shock, no rise in temperature, requiring no stimulation whatsoever—in fact, the picture of happiness and comfort, with practically no exceptions in any case. They show no operative reaction. From the short duration of the operation, the minimum trauma to the tissues, the minimum amount of anesthetic, they get along even with bad kidneys very well. There is no uremia. I tackle any of the cases. Some of the cases are almost moribund, some with extravasation of urine, some with false passages. Age is no limit. I have had a good many cases over eighty. I operated on one gentleman who is now ninety years old. He is living and enjoying life. Now the demeanor of these people as compared with elderly persons whose bladder is opened is very marked. There is no reaction and no operative shock.

Dr. Francis R. Hagner of Washington, D. C. Personally I have had more experience with the perineal than with the suprapubic operation. I believe that there are some cases which are unquestionably better attacked through the suprapubic route. But there is one point with reference to the suprapubic route which I would call attention to. Dr. Chetwood mentioned that one of his cases was a stout man. I believe in those cases the suprapubic route is absolutely contraindicated. I saw Freyer do prostatectomies in three and four minutes. I had one that I did in four minutes, but the next one took me an hour. This was a big man, with a large, pendulous abdomen, and his prostate was so far down that I could hardly reach it, and I nearly broke my arm getting it out.

There is another point. The Doctor says he has never lost a case from sepsis. I have, I am sure. I believe that the uremia these patients have is dependent on sepsis. For the last year in every prostatectomy that I have done where there was marked cystitis and I thought there was possibly a pyelitis, before or immediately after operation I have had a vaccine made from that patient's urine, and I believe I have saved patients that unquestionably would have died.

I had a case of gangrenous cystitis. When I first saw that man he looked almost moribund. I had never smelt anything like his urine. It was like the odor from an old carcinoma of the uterus. The doctor who was attending the patient said he had four quarts of residual urine. When I catheterized him he had two quarts. When I cystoscoped him his bladder was absolutely black, and there was no mucous membrane that I

could see. That patient had continuous irrigation by the perineal route for a week, then a perineal prostatectomy, and then a vaccine made. He did well for nine days, when he became very drowsy. There was no fever. The pulse was rapid, tongue coated and dry, and he presented every appearance of urinary septicemia. I began giving him the vaccine made from the urine, and after the first injection, his mental condition cleared up, and the improvement was very marked. He received several injections afterwards, and at the time of the prostatectomy I got a slough out of his bladder as large as my hand. The patient has made a perfect recovery, and the remarkable thing is that he has absolutely no contracture of the bladder. He holds his urine all night, occasionally urinating once at night, and has not over a drachm of residuum. I believe the result was due to the vaccines.

DR. A. T. CABOT of Boston. I do not think that I can fairly be described as ever having belonged to any camp in prostatectomy. I have operated by both methods in almost every year since I began operating on prostates. In the past year I have operated through both the suprapubic and the perineal route, as I have ever since I began to operate on prostates at all. I find that I have, however, come to choose the perineal route as the method of choice in my operating. I use the suprapubic route when I think or know that there is some condition in the bladder back of the prostate which I wish to investigate or to operate upon. When I am operating for the prostate alone, except in the case of a very enormous third lobe, I choose the perineal route. Through the perineal route I have removed very large lobes, as large as a double English walnut. It seems to me that in that specimen that Dr. Chetwood passed around the failure of the perineal route should be ascribed to the operator rather than to the method. I think that that lobe could have been removed. It is sometimes very difficult, unless we make a digital examination of the bladder before closing the operation, to avoid missing such a lobe, because when we remove the prostate below, the lobe falls back into the bladder and you have to reach well in with the finger in order to pull it down. By taking a stone scoop and passing it over such a lobe, you can bring it within reach readily and remove it.

I do use irrigation. At one time I did not use it. On the whole I think my patients are more comfortable when I use it, for the reason, as Dr. Chetwood has stated, that you avoid the clotting and filling up of your tubes, you provide a constant flow, and do not have to clear your bladder of clots afterwards. I use an irrigation which runs by drops, and even

that I find is sufficient, unless in a case of very considerable bleeding, to keep the outflow rapid enough to carry off the blood as it oozes out.

DR. L. BOLTON BANGS of New York. Without being committed to any particular method of operation upon the prostate, I should like to say a word or two in favor of the suprapubic method, but in particular cases. I agree with what has been said by the last speaker that the choice of operation is sometimes a matter of judgment. But there is a form of outgrowth of the prostate which may be very easily overlooked, and which acts as a valve, and this, if the operation has been done by the perineum, will spoil the results. We have had two recent cases in which there was a vertical outgrowth from one side of the prostate, like the first joint of my thumb. The bladder would contract and expel a certain amount of urine. The further contraction of the bladder would bring this outgrowth across the internal meatus, and no further urine could come out. In such a case the suprapubic method is the successful one. I am confirmed in that because in a case where I did the perineal operation there was still retention and the development of a stone; I did a suprapubic operation within a few weeks and the condition was immediately relieved. The cystoscope did not reveal the condition, nor was it felt at the time of the previous perineal operation. In that particular case we did purposely leave a portion of the prostate, because the case suggested incontinence, and in the individual in question that would have been a very serious matter.

One word of caution as to the use of the indwelling catheter. There are cases which will tolerate it and may tolerate it for a long time, even for several weeks. But there are other cases in which immediately there will be an attack of urethral fever. I have seen the presence of a catheter so disturb the granulating process that infection took place, with a rise of temperature, and in one particular case which we recently had under observation it was a serious matter.

DR. CHETWOOD in closing. I appreciate very much the general remarks that have been made, and I think it is entirely consistent to agree with all of them.

As to the size of the tube or indwelling catheter, about which Dr. Hayden asked, I have been accustomed to use a number 16 or 17 French.

I might jump to the remarks of the last speaker and say that I have also found that some tolerate the indwelling catheter very much better than others, and my action is entirely governed by experience in that respect. I have not, however, known urethral fever to occur from the indwelling catheter, but have had irritation along the ducts and conse-

quently epididymitis. In every case that I can recall in which that occurred there had been a previous epididymitis.

I agree with Dr. Watson that in doing the operation we should not sacrifice thoroughness for speed. A sufficient length of time should be given to the operation to do the work in a proper manner.

As to irrigation: I commenced using irrigations in perineal cases, first by trying two catheters together, and later by the Hagner tube, and my experience was so satisfactory in the early post operative days, the patient was so much more comfortable, and the straining due to clots was so satisfactorily avoided by continuous irrigations, that I have been using them in suprapubic cases also with good results. I employ a tank from which the irrigating fluid flows drop by drop.

The drainage period is divided into three stages: First, immediately after operation when there is a greater liability to clot formation, we use irrigation. Then when the tube begins to loosen up siphonage keeps the bladder dry. Then we pass from the suprapubic outlet to the indwelling catheter, allowing the patients to get up, strapping the wound together, so that normal urination follows removal of the catheter.

I would not undertake to state the proportion of cases suitable for suprapubic or perineal prostatectomy. That many can be done better by the suprapubic route there is no question.

STENOSIS OF THE VESICAL OUTLET FOLLOWING PROSTATECTOMY, WITH REPORT OF A CASE

By J. Bentley Squier, M. D., of New York.

A SEARCH of the literature on prostatectomy shows but few reported cases of stenosis of the vesical outlet following operation. Some writers allude merely to the desirability of an occasional passage of a sound to guard against possible stricture of the deep urethra and others regard this as an unnecessary precaution.

Two such cases having come under my observation recently, make me feel that the subject is of more importance than has hitherto been considered, and therefore justifies this brief communication.

The first case of this character was a patient of Dr. L. Bolton Bangs. He has already reported this case in detail before the Medical Society of the State of New York, therefore I will only outline its most salient features. The patient was aged sixty-six and gave evidences of marked general sclerosis. Perineal prostatectomy was performed for, practically, total retention of urine and the patient made a quick, uneventful recovery from the operation. At the end of eighteen days when he left the Sanatorium and returned to his home, he was voiding urine every four hours and completely emptying his bladder. A month later he began to develop increased frequency with dysuria. The stream had become dribbling and feeble. His physician found it impossible to catheterize him and Dr. Bangs was called to his home in consultation. As I had assisted Dr. Bangs at the prostatectomy he invited me to be present at this consultation. We found it impossible to enter the bladder with an instrument, the obstruction being deep in the urethra. Suprapubic cystotomy was decided upon with the idea in view of retrograde catheterization. After the bladder was opened, the following conditions were found, the description of which I give in Dr. Bang's graphic words. "Careful examination of the interior of the bladder repeated both by myself and my associate, Dr. Squier, failed to find any normal internal meatus. But at the anatomical situation of the latter could be felt a shallow-funnel-shaped dimple. Inferior to this was a thickened bladder which, aided by bi-manual palpation with two fingers of the other hand in the rectum, was made out to be the contracted capsule of the prostate covered by the muscular and mucous wall of the bladder. All efforts to introduce instruments of minute size into this dimple failed. Consequently, a staff was placed in the urethra and the perineum freely opened. Short, thick, interlacing fibrous bands had displaced the normal structures, and although there was a series of shallow pockets between these bands, forming a semblance to an irregular channel, no opening leading from this channel into the bladder could be found. A blunt-pointed instrument was then placed in the conical dimple within the bladder, and being held firmly in place by

my associate, I severed the bands in the perineum until the point of the instrument was reached and an opening thus made into the bladder through which the index finger could be introduced. A sound of the size of 26 F. was then easily passed from the meatus into the bladder. Supra-pubic and perineal drainage were established which the patient bore very comfortably and convalescence from this second operation was uneventful."

The second case occurred in my service at the New York City Home. He was a patient sixty-nine years of age. His urinary history dated back to November, 1906, when a benign tumor was removed from his bladder by suprapubic incision at the Metropolitan Hospital in New York City. On June 9th, 1908, at a second New York City Hospital he was given suprapubic drainage of the bladder for the relief of retention of urine. He left this hospital before the wound had healed and was lost sight of until October, 1908, when he appeared at another New York City hospital and a suprapubic prostatectomy was performed by a surgeon well skilled in such work. Following this operation a ventral hernia developed and three months later he went under a secondary operation for repair of the rupture. He came under my care on February 5th, 1909, when he was suffering from dribbling of urine, tenesmus, dysuria and abdominal pain. I found on examiantion a bladder distended almost to the ensiform cartilage and the patient's general condition very grave. Repeated attempts to enter the bladder by way of the urethra demonstrated an impassable obstruction to the entrance of any instrument, even a filiform bougie. Suprapubic cystotomy was at once performed under local anesthesia and a condition was found similar to the case previously related. The situation of the internal meatus was located by a dimple in the centre of which was an opening through which it was barely possible to pass the finest filiform. This opening was enlarged by making stellate incisions through a dense cicatrix which had formed around the vesical neck at this point. A sound No. 30 F. was passed through the penile urethra into the bladder after I had demonstrated by bougies à boule that there was no stricture for-

mation at any other point in the urethra. The bladder was drained only suprapubically. The consequent course of the convalescence was uneventful. A sound was passed every three days for three weeks. The suprapubic wound healed kindly and now, three months after operation, the patient empties his bladder completely and the occasional passage of a sound has kept the urethra patent.

These two cases demonstrate that cicatricial stenosis of the vesical outlet may occur after either perineal or suprapubic operation. The prostatectomy in each instance had been performed by a surgeon with wide knowledge of the surgery of this region and, therefore, the element of error in technique can be practically eliminated.

Possibly the complete removal of the prostatic urethra at time of operation may be responsible for the condition described, but as so many cases have been reported in which such removal apparently had no dire after effects, this supposition is theoretical. It may be important to note that the cicatrix following the perineal operation extended along the site of the prostatic urethra for some distance, whereas the cicatrix resulting from the suprapubic operation formed only an essential collar around the vesical outlet and did not appreciably invade the deep urethra.

DISCUSSION

Dr. Abner L. Post of Boston. I should like to mention a case in which the prostate was removed suprapubically five or six years ago by a skilled surgeon. The operation, according to all accounts, was a somewhat difficult one, the prostate being removed piecemeal. The operation was followed by mental symptoms which were extremely disagreeable, apparently of a hysterical nature. They were of such severity as to render any subsequent operation to remedy the present condition decidedly to be avoided. He complained that he was suffering from severe cystitis, and spent a large part of his time in the bathtub. He was seen by an individual who promised him some relief by opsonic treatment, and during last summer he made frequent journeys of over a hundred miles for this treatment, without relief. With the aid of a little cocain, which was fol-

lowed by hysterical symptoms for many hours, I was able to make out that the urethra could be entered only by an instrument, which barely exceeded a filiform, and by the utmost patience it has been possible somewhat to relieve his symptoms by gradual dilatation up to 8 or 10 French. The tight portion of the stricture was away down at the mouth of the bladder, and was undoubtedly the result of the surgical operation.

Dr. Edward Martin of Philadelphia. I have one case to add to Dr. Squier's interesting series, that of a man upon whom a skilled surgeon performed a suprapubic prostatectomy. Nine months later he suffered from renal colic and passed a calculus into his bladder. There followed distressing vesical symptoms, with distention. These had been entirely absent before his renal colic. I was unable to pass anything into his bladder. The obstruction was at the vesical orifice. I removed a small vesical stone through the old suprapubic cut, and incidentally a second one from the ureter of the left side. The internal meatus was presented by a dimple through which a filiform could be passed. I cut the constricting band and the internal vesical sphincter in two directions, thereafter passing my finger through it to the first joint. The man had no further trouble, nor was he subsequently sounded except for a brief period.

Dr. A. T. Cabot of Boston. I wish to agree with the suggestion of Dr. Squier as to the advisability of passing sounds after some of these cases. I have had perhaps four or five cases where the urination was not thoroughly satisfactory following operation, and, in which, after passing sounds, it became so. Evidently there was a contraction or a valvular fold which was relieved, and I not infrequently use the sounds immediately after or during the convalescence. I have one case now under observation where a stenosis came five years after operation. In that case I think the stenosis is at the entrance of the urethra into the prostate. I think it is anterior to what remains of prostatic urethra and that it is very greatly aggravated by muscular spasms there. In that case the use of sounds is followed by relief.

Dr. G. K. Swinburne of New York. There is one other form of urinary obstruction which one might easily take to be stenosis, but which is not stenosis of the vesical outlet, and that is a case such as Dr. A. T. Cabot reported several years ago, the formation of a cuff in the prostatic urethra causing a valve-like obstruction. The passage of sounds in such cases would not have any good result. I have had a gentleman under my care this winter with such a condition following a suprapubic prostatectomy. He had had complete retention, and the operation was done

by a very able surgeon, and he did not want to have a secondary operation, which would have quickly removed the obstruction, but he wanted the posterior urethra examined, and there it was very easy to find a flap apparently from the floor of the urethral canal which evidently was raised up on urination. I attempted to cut through that with an electro-cautery, and had to have both battery and cautery made, and, while I was able to relieve it to a certain extent, we had to make so many sittings that it was thought best to cease and see what the results of what we had done would be. As a matter of fact, he was able to urinate four or five ounces, and thus at times get a certain amount of relief. At the same time, he was obliged to use a catheter most of the time. As far as sounds are concerned, he takes a full 30 French without the slightest difficulty, and yet when he came he could not pass a drop of urine.

Dr. L. Bolton Bangs of New York. It may not be germane to this subject, but I would like to ask the members of the Association if they have met any relapses after the Bottini operation. I have had two. Upon one of these I had to do a prostatectomy, and the other one has had a relapse and is obliged to catheterize himself all the time, seven years after the operation.

Dr. A. T. Cabot of Boston. I should like to report that I have operated in one such case. It was a case that Dr. Bangs did a Bottini upon. I found no residual urine. The Bottini was an absolute success in emptying the bladder, but the patient later suffered when the bladder closed down and that suffering was due to an ulcerated lobe projecting into the bladder which I removed by the suprapubic method with entire relief.

Dr. Hugh H. Young of Baltimore. I had a patient on whom I performed a Bottini operation and, although the prostate was extremely large, with an extreme intra-vesical enlargement of both lateral lobes, the result was excellent in restoring normal urination, but six months later he began to have severe hemorrhages which recurred at intervals of a week or two, and in one or two instances were so alarming that I feared for his life. I put him into the hospital, gave him infusions until he got strong, and finally did a perineal prostatectomy. The prostatectomy was not done, however, on account of obstruction or because he did not have a perfect functinal result, but simply as a life-saving measure on account of the hemorrhages. There has been no recurrence of the bleeding.

A year or two ago a surgeon in London showed me a specimen from a case where there had been complete obliteration of the urethra after

suprapubic prostatectomy, so that it was necessary to establish a permanent suprapubic fistula. It was a small prostate and had been removed in one piece and the encircling fibres of a capsule were evident. In the dissection he must have gone much nearer the periphery of the capsule than one does usually in a prostatectomy.

It seems surprising that there have not been more cases of stenosis or complete obliteration of the prostatic urethra after the operation, in cases in which the anterior commissure and the prostatic urethra are removed. Apparently it does not occur if a certain thickness of the capsule is left. In the specimen shown me I think that most of the capsule had been removed. That it is entirely unnecessary to remove the anterior commissure or even much of the urethral mucous membrane in suprapubic prostatectomy has often been demonstrated in America.

As regards strictures following prostatectomy, I think they occur very seldom. Personally I never advise passing sounds, and in my practice I do not think one case in a hundred has sounds passed on him. I do not believe strictures ought to occur after perineal prostatectomy. With a linear urethral incision made back of the triangular ligament and its muscular structures you have a wound which ought not to reduce the urethral calibre at all. I know of one case in which I took away unintentionally a good deal of the posterior urethra and a stricture resulted. That is the only case I know of in my practice, and this was easily relieved by dilatations.

Dr. Francis R. Hagner of Washington, D. C. I have done the Bottini operation twice during the last two years, but before that time I had done it in fifty cases, and I have done prostatectomy on three of those cases. One of them was relieved for three years and then had to have a prostatectomy.

Dr. Squier in closing. I thank the gentlemen for the discussion and I think there is nothing to add. We have at least brought both camps together on this subject as the complication of stenosis has occurred after both forms of prostatectomy.

SUPPLEMENTARY REPORT ON THE OPERATIVE TREATMENT ON GONORRHEAL EPIDIDYMITIS

By F. R. HAGNER, M. D., of Washington, D. C.

THIS supplemental report of 12 new cases of the operative procedure in gonorrheal epididymitis is presented with the hope of obtaining a fuller discussion, especially from the members who have employed this surgical procedure, since the presentation of this subject last year. The series of cases now reported permits me to answer in greater detail questions which then arose as to whether there were organisms to be found in acute gonorrheal epididymitis other than the gonococci.

Bacteriology. Careful bacteriological examinations have been made on all the later cases. In the 21 cases reported last year either no organisms were present or if present the gonococci alone were noted. In this series of 12 cases, gonococci were present in the epididymis in five cases, in six of them no organisms could be demonstrated in culture or cover slips; in one case a diplococcus was present morphologically like the gonococcus decolorizing by Gram but growing luxuriantly on ordinary media. Dr. Wilkinson, assistant pathologist at Garfield Hospital, thought this organism was some contamination. In the 33 cases reported by me no organisms other than the gonococcus have ever been demonstrated. This fact is rather interesting, as I have never been able to secure any bacteriological data relating to gonorrheal epididymitis.

Presence or Absence of Fluid in the Tunica Vaginalis. In cases five and nine of this series a condition was observed in the tunica vaginalis, which was not present in the other cases. In all the other cases there was fluid present in the tunica vaginalis. In case No. 5 the epididymitis was present seven days before operation and in case No. 9, three days. The condition in both of these cases was similar, namely, that no fluid was present and a great amount of fibrinous lymph was observed, resulting in an agglutination between the parietal and visceral layers of the tunica

vaginalis and so firm was the adhesion that it was only with difficulty that these layers could be separated. Of the 21 cases reported last year 13 came to operation on or before the seventh day of the disease, in all of which fluid was present in the tunica vaginalis. Of the 12 cases reported now ten were operated within seven days and in only two was there an absence of fluid.

Pus. In 25 out of the 33 cases reported pus was present. In this connection case 12 is of particular interest because of the early development of suppuration. For ten days this patient had been under treatment for an acute gonorrheal prostatitis and had no symptoms of involvement of the scrotal contents. At 11 o'clock on the morning of December 16 he reported to me that during the previous two or three hours he had had tenderness which he referred to the inguinal region. Palpation discovered no enlargement of the inguinal glands; however there was tenderness of the cord near the ring, but there was neither pain, tenderness, induration, nor other signs of involvement of the epididymis. There was no change in his condition for twelve hours, when excruciating pain suddenly developed in the left testicle, which continued until 11 o'clock the next morning when I saw him. At this time he had a well marked epididymitis with marked swelling, the circumference being about twelve inches, and all of the characteristic signs of a most acute epididymitis—temperature 101; leucocyte count of 18,000; there had been no chill. He was operated on three hours later—within fourteen hours of the first pain referred to the testicle.

At operation the tunica vaginalis contained two ounces of clear fluid, the globus minor was greatly thickened and covered with lymph; hemorrhagic areas were seen over the visceral layer of the tunica vaginalis; three distinct abscesses were found on puncture of the globus minor, one containing about half a drachm of pus and the others about 20 drops each.

General Results. Pain. Of the 33 cases operated on with but one exception, which I mentioned last year, pain has been absolutely relieved by operation.

Induration. I believe there is no question that the indura-

tion is much less following surgical treatment than after palliative treatment. In none of the cases have the hard or tender nodules, seen in cases treated palliatively, persisted after operation. Although in a few of the cases, especially in those in which the epididymitis has been of long standing, a general induration of the parts has persisted for some time.

Testicle. In none of the cases have I been able to note any involvement of the testicle, the tension has not been increased, and no areas of induration have been noted.

Urethral Discharge. I have had but one case that has had the recurrence of a profuse urethral discharge, such as is seen in the beginning convalescence of the cases not operated on. This occurred in case No. 12. By this I do not mean to say that patients do not have any urethral discharge after operation, as some have had a scant discharge due to inflammation of the urethra or its adnexa.

Recurrence. I have had but one case of recurrence after operation, this occurred in a case I was invited to operate on by Dr. Tilden Brown at Bellevue Hospital. This was a very mild case and not one I would have operated on from choice. There was no pus present and only very slight involvement of the globus minor. The patient made a good recovery but returned in two weeks suffering from a recurrence on the same side.

There has been but one case with a double epididymitis. This is a recent case and although the induration has almost entirely disappeared, no spermatozoa have been noted yet in the secretion; but only one examination has been made. I am still hopeful that after complete resolution we shall find spermatozoa present.

Epididymotomy shortens the duration of the disease (the average period of confinement in my last series was about four days), it relieves pain immediately, convalescence is rapid; and results justify the conviction that in severe cases the operation has a place in surgery.

DISCUSSION

Dr. George S. Whiteside of Portland, Oregon. I would like to say that I have operated on a few cases of acute gonorrhœal epididymitis

after Dr. Hagner's method, and it seems to me the great argument in favor of that operation that after the man comes out of the ether he never has any more pain.

Dr. Henry H. Morton of Brooklyn. I have operated on five cases of gonorrhœal epididymitis by Dr. Hagner's technique in the past year. Two of them were exceptionally severe, and the others were just the ordinary forms of epididymitis that one sees complicating gonorrhœa. From the observation of these five cases I should say the operation is indicated in very severe cases, with intense pain which is not controlled by morphia. The effect of the operation in both the severe cases was perfectly astonishing. The day following the operation, when I came in to see the patients I found the pain had entirely gone, and it never returned. In the ordinary cases the operation did not seem to me to shorten the time of convalescence very much. The patients were out of bed in about a week, and resolution would go on slowly, but it was not complete for several weeks. In spite of the operation it took about the usual time for resolution to occur. In two of our cases we had a relapse after leaving the Hospital. What they did I do not know, but they came back with a recurrence on the same side.

In two of the series of cases operated upon we found small abscesses in the epididymis, and in both of these cases we found the gonococcus present in the pus.

Dr. George K. Swinburne of New York. I have had no opportunity to make use of Dr. Hagner's operation, although I have looked for cases, because I have not had any cases where it seemed to me the pain justified the operation. That has been my misfortune. There are not many of these cases. I have seen cases in the beginning, and I have always used the serum. I note that in one of Dr. Hagner's cases the man had a preceding prostatitis. I have had one or two cases of prostatitis this year in which an early injection of the serum has aborted the prostatitis. As far as local urethral treatment is concerned, I always use a deep instillation with a small soft rubber catheter during the time that the man has his epididymitis, and all of the cases that I have had in the past two years since I heard Dr. Hagner's first paper have been cases that could move about. One was a case of relapsing epididymitis in which we used the Belfield operation, and he had an immediate cessation of pain following that. That was done under cocain in the dispensary.

I want to ask Dr. Hagner where he makes his incision, and also whether he operates under local or general anesthesia.

DR. E. L. KEYES, JR., of New York. I would like to state my agreement with Dr. Hagner with regard to his operation, from an experience of four gonorrhœal and two non-gonorrhœal cases. One was done under local anesthesia. The patient was of a sturdy constitution and the testicle was not extremely large, so I thought it would be possible to infiltrate and block the nerve. I did not succeed. I got down to the abscess, which was small, with perfect comfort to the patient. The incision of the abscess itself was as painful as one would expect it to be. It was not blocked in the least.

The one point I should like to bring up as my small contribution to the discussion is that I have neither used antiseptics nor drainage in these cases. In all the cases in which I have found pus it has been no more than a few drops. I have mopped that away and sutured up the wound by interrupted sutures.

In every other respect my experience agrees with that of Dr. Hagner. There has been complete cessation of the pain, and an immediate drop of the temperature and of the leucocytosis.

DR. J. H. CUNNINGHAM, JR., of Boston. I should like to ask Dr. Schmidt if the procedure of Belfield has proved of any particular value in those cases in which he used it. At the meeting of their society last year in speaking of the patients on whom I had operated up to that time after Dr. Hagner's method, I stated that in two cases in which the vesicle had been involved on the same side I had employed the Belfield procedure in the hope of treating the vesicle. It certainly suggests a practical method of draining the seminal vesicle through the vas when the infection has traveled down into the epididymis. In my two cases the results were about the same as in those in which I did not do it, and I should like to know what Dr. Schmidt's experience has been.

In connection with this operation of Dr. Hagner's patient I have recently operated upon a patient in whom I thought I was dealing with a bilateral gonorrhœal epididymitis, but it turned out that we had an acute gonorrhœal epididymitis on one side and an old tubercular focus apparently lit up by the gonorrhœal infection on the other side, and I performed Dr. Hagner's operation on the side infected with gonorrhœa alone, and removed the epididymis infected with tuberculosis and gonorrhœa and attempted to make an anastomosis of the testicle with the vas deferens.

DR. HAGNER in closing. I am very much obliged to the gentlemen for the discussion of this paper. It certainly is a great satisfaction to me

to hear a man as careful as Dr. Schmidt practically bear out everything I have said about this operation.

Dr. Schmidt spoke of the pathological condition. In the first report of this operation that I presented I took up the pathological study of it. I had only six cases then. The condition which he describes bears out exactly what I said in the first paper. The lymph over the epididymis when pulled off looks exactly like a diphtheritic membrane.

Dr. Schmidt said the duration of his cases was longer than some of mine. Of the twenty-one cases that I reported last year one lasted twenty-four days, one twenty-one and one twenty-eight. They were later cases than any of those of the group operated on here.

Dr. Schmidt spoke of an abscess connecting with the testicle. Was the testicle involved too?

DR. SCHMIDT. Yes.

DR. HAGNER. That is the first case I have heard of. In none of my cases has any involvement of the testicle been present.

Of course, this work is more or less in its infancy, and somebody is going to get bad results. They are bound to. I think it is really remarkable that so many good results have been obtained.

Dr. Schmidt spoke of incision of the vas. Many of my cases had induration of the vas. I have opened one and injected argyrol in the way that Dr. Belfield does. But I do not believe that case did any better. It may be a good thing, as Dr. Schmidt suggests, to incise the vas and relieve tension in that way.

I do not believe there is any question but what the nodules seen after epididymitis are simply healed abscesses. I have operated on several of those for persistent pain, and there was broken down fluid in the center of them that unquestionably was pus. A large percentage of the severe cases have pus in them. I do not believe there is any question that those nodules are the site of the suppuration.

Dr. Morton spoke of his five cases, in two of which there were recurrences. Out of all the cases operated on, I have been able to learn of but three recurrences, including these two of Dr. Morton's. I do not know whether that argues for or against the operation. It may mean that the operation does not cause an obstruction of the ducts; it may be that the infection is there and simply lights up again. But recurrences are certainly much less frequent following operative than non-operative treatment.

Dr. Swinburne asked about the incision. You cannot feel the testicle

itself in the great majority of the cases, because there is a marked hydrocele present. But I feel for the hard edge of the epididymis, and when I find that I there make my incision, which should be just long enough to turn the testicle out. I then scrape off all the lymph.

I have used general anesthesia in all my cases. I believe, however, if you are careful to cocainize the skin, cut up a little higher in the inguinal region and cocainize the cord, it may be possible to do the operation under local anesthesia. Dr. Fowler has done operations for hydrocele in a number of cases by simply cocainizing the cord. I believe it would be possible in these cases, and I shall try to demonstrate whether it is possible or not.

I have drained all my cases. I do not know whether it is necessary or not. I use a small cigarette drain. I put the drain right down in the tunica vaginalis. The drain stays in from twenty-four to forty-eight hours. No pus escapes; only a little bloody serum.

I always wash out the tunica vaginalis with bichlorid and salt solutions, simply because I started to do it.

Dr. Keyes spoke of a sensitive nodule remaining in one of his cases. That is the first case I have known that to occur in. I think the value of these discussions is in bringing out such points as that.

I am very much interested in Dr. Martin's work. Nobody deserves more credit than he does for the operative treatment of sterility. I have been very fortunate. I have had three cases, and in two of them there has been a return of spermatozoa. One of the cases I spoke of last year. His wife has since given birth to a child. The other case has millions of spermatozoa, but is not married. The third case is a doctor who came from the West, and it has only been about two weeks since he was operated upon. In one case there was a return of spermatozoa in three and in the other in four weeks. Whether it is a little inflammatory exudate that prevents a sinus from forming between the epididymis and the vas deferens, delaying the appearance of the spermatozoa, I do not know, but I believe it is. When that exudate is absorbed, the sinus opens up, and a passage for the spermatozoa to reach the vas deferens is made in that way.

DR. SCHMIDT. I have nothing to add except to state that I think we shall have to admit that the operation at the present time is on a fairly firm basis. I think the cases best suited for the operation are those that start in with terrific pain and high temperature and which usually make it necessary for the patient to go to bed and require the use of opiates to control the pain. If you can cut down this period of convalescence to

practically nothing and be assured of a good functional result, I think the operation ought to be carried out a great deal oftener than it is. Naturally if the Belfield operation is made at the same time the real seat of the disease can be treated at the same time. I have commenced to do this and will report a series of cases next year.

SARCOMA OF THE PROSTATE

By C. L. GIBSON, M. D., of New York.

THIS disease is fortunately rare, as so far it has defied all resource of the surgical art to relieve it. It is not quite so rare as a perusal of the literature would seem to show, because the various statistical observations of accepted value have wisely refused to admit cases not backed up by a definite microscopical examination. As the great majority of these cases are unamenable to surgical treatment, and as autopsies, particularly in this country, are difficult to obtain, suitable material for microscopical examination will only exceptionally be available.

When I reported my first case to this Association in 1904,* I could find only one extensive tabulation of authentic cases (Socin, 1902, *Deutsche Chirurgie*) twenty-four in all. Powers (*Transactions of the American Surgical Association,* 1907) would accept only twenty-three cases including his case and mine.

The latest observation by Proust (*Annales des Maladies des Organes Génito-Urinaires,* 15 Mai, 1907) tabulates 34 authentic cases and 14 probable. This list is obviously incomplete, however, and does not contain Powers' case or mine of 1904.

It is not necessary, however, to demonstrate by more extensive literature references that the disease is uncommon. We should be on the alert to discover its existence at an early stage, using, if necessary, extraordinary expedients, such as exploratory incision, in order to remove the disease radically at a period when it is confined to the prostate. As most of the cases occur in young

* Paper was not published.

individuals, any unusual size of the prostate or otherwise unexplainable obstructive symptoms should bring the possibility of this tumor to our minds.

My first case, (reported to this Association but paper never published) was kindly referred to me by Dr. P. R. Bolton, who had operated on the man, aged 35, at the New York Hospital in 1904, removing an intravesical projection from the prostate which had greatly interfered with evacuation of the bladder. The portion removed was reported by the Pathological Laboratory to be a small round cell sarcoma of the prostate.

The tumor of the prostate grew rapidly and the patient came under my care at St. Luke's Hospital four months after the previous operation. Rectal examination showed a diffuse, even, firm mass occupying the prostatic region, the size of a small fist.

The prostate was removed *en masse* with the neck of the bladder by a combined suprapubic and perineal operation, but the patient succumbed to increasing exhaustion. No autopsy.

The history of my second case is as follows:

G. G., 36. Married. Italian and laborer. Admitted to St. Luke's Hospital November 10th, 1907. Kindly referred by Dr. M. J. Echeverria.

There is no history of venereal disease.

Present Illness: About two months ago began to notice pain in the lower abdomen, somewhat more marked on the right side, pretty constant, with occasional exacerbations. Urination is frequent, particularly at night. Has trouble in starting stream, and has to strain to empty bladder. Also some scalding sensation. The urine is often cloudy; but blood has been absent. No urethral discharge. There is loss of weight and strength. Constipated.

Examination shows an abdominal distention below the umbilicus. A mass can be felt extending from the umbilicus well down into the pelvis; hard and not freely movable. There is a retained left testicle.

Rectal examination shows the axis of the rectum deflected

to the right. An irregular mass, size of the fist, hard and immovable, replaces the prostate. A soft catheter passes easily, withdrawing an ounce of residual urine. Slight elevation of temperature and pulse.

Blood examination 9900. Polynuclears 80%.

Urine examination varied, but usually showed blood and albumin.

November 15th. Exploratory operation to determine whether radical removal might be feasible; but it was found that the mass involved the other pelvic contents to a degree that made removal impossible. Fragment removed for microscopic examination.

Suprapubic drainage for prophylaxis of developing obstruction.

The growth of the tumor was very rapid; but the patient was now free from pain. Coley's fluid used without appreciable results. Died in midst of general exhaustion; the tumor mass then nearly filled the whole abdomen.

Pathological report by Dr. F. C. Wood. Macroscopic examination: Specimen consists of several small pieces of tissue removed from tumor of the prostate. Microscopic examination: Sections show a small round cell sarcoma which is moderately vascular. The cells are regular in outline, not closely packed together, but separated by considerable intercellular stroma. Mitoses are frequent.

Number of Authentic Cases. Analysing the cases tabulated by Powers and Proust, eliminating those in the latter's table which are not accepted by Powers, we have twenty-three namely:

Rose	2	Hind	1
Socin	3	Van der Hoeven	1
Tordens	1	Grattzer	1
Kaufmann	4	Barth	1
Birsch-Hirschfeld	1	Oleva	1
Schaleck-Bayer	1	Guyon (Proust)	1
Ley	2	West	1
Spanton	1	Stein	1

Hughes (Wharton)	1	Botesen	1
Burckhardt	1	Gibson (first case)	1
Verhoogen	1	Stern	1
Marsh	1	Powers	1
Mathias	1		

To these must be added Cabot's second case (J. K., age 75. Operated April 21, 1904. Tumor. Examined by Dr. F. W. Whitney, and found to be a small spindle cell sarcoma—in "Papers upon Genito-Urinary Surgery," by A. T. Cabot, Boston, David Claff & Son, 1907).

Gibson's second case:

Bobbeo (Turin) reports a case with autopsy and microscopic examination.

Defrage (*Journal de Chirurgie,* Bruxelles, 1909, page 372) successfully removed a prostate weighing 650 grammes from a man of 25. Microscopic examination showed small, round cell sarcoma.

These are the absolutely authenticated cases up to 37.

THE NATURE OF NEW GROWTHS OF THE BLADDER

By Robert Holmes Greene, A. M., M. D., of New York.

THE material on which this short paper is founded is gathered from a study of the literature on the subject, from the examination of records of 500 autopsical cases, 100 of which showed lesions of the bladder, and which were used as a basis of a paper published by Dr. Brooks and myself, "A Contribution to the Pathology and Prognoses of the Diseases of the Bladder," by Robert Holmes Greene, A. M., M. D., and Harlow Brooks, M. D., *The Medical News,* N. Y., June 20, 1903; also from the study of some of our autopsical records made since that time, from some material furnished through the kindness of the Russell Sage Foundation Pathological Laboratory of the City Hospital of New York, and as a re-

sult of some few cases of bladder tumor which the writer has had an opportunity to observe in the practice of other men, as well as from the study of some which he has had an opportunity to operate upon himself. It is, in a way, a continuation of the paper by Dr. Brooks and himself previously referred to, and is a preliminary study of one of a series which the writer hopes to continue later on when he trusts more personal material will be at his command, and which will contain a more detailed account of what he has already collected. He desires to express his thanks for assistance rendered in the preparation of this paper by his associate, Dr. F. J. Schoenenberger.

Concerning the classification of bladder new growths, the simpler ones appeal to us the most as surgeons, and probably that of Albarran's is for us as practical as any. (J. Albarran, *Médicine Opératoire des Voies Urinaires,* Paris, 1909.)

1. Epithelial tumors (common) — Papilloma, Epithelioma
2. Sarcoma.
3. Myoma—cysts, fibroma, angioma, etc.

1. A. Pediculated.
   B. Sessile.
   C. Infiltrated.
      a. "Infiltrative larvae." that is with islands of infiltration.
      b. "Infiltrative Salliant."
      c. "Tumors infiltrating but not extending into the cavity of the bladder, called cancroidales from their resemblance to the eye of cancroidal eruptions of the skin."

In all these forms with the exception of sarcoma, tumors of the epithelium which include benign papilloma and various forms of carcinoma are the only ones of which this paper will take cognizance.

The writer knows of no surgical subject on which more statistics have been gathered and carefully elaborated than bladder tumors, but the fact that there exists such a mass of statis-

tics from so many observers is in itself confusing to the mind. Most of the statistical tables have been compiled by European observers, although we may feel gratified in knowing, as most of us do, that some valuable and interesting work in that line has been done by Dr. Frank S. Watson, of Boston. (Watson and Cunningham "*Genito-Urinary Disease,*" 1908).

Concerning frequency of bladder tumors: Frisch and Zuckerkandl, Vienna, 1905, quote Kuster, Ultzmann and Burghardt, as stating that tumors of the bladder occur in 3% of all diseases of the genito-urinary organs. Greene and Brooks in the artical records. It is interesting that they agree as nearly as they marked lesions of the bladder. Ultzmann drew his statistics from clinical observation, Dr. Brooks and the writer from autopsical records. It is interesting that they agree as nearly as they do. Perhaps it would be safe to say that in some three to five per cent. of the cases of diseases of the bladder tumors of the bladder will be found to be present. This would indicate that the frequency of bladder new growth is more general than is ordinarily supposed to be the case, and now that the cystoscope has come into more common use we may expect that new growths of the bladder will be reported with increasing frequency.

Concerning sarcoma of the bladder just as with sarcoma of the prostate it seems to be being reported with increasing frequency. The writer at the present time is not able to demonstrate this through statistical evidence, but it is his observation after reading some of the more recent literature on sarcoma and he finds the same idea has already been expressed by other observers as: Bernard Croybel ("*Das Sarkom der Blase,*" Breslau, 1908), Raffin *Trans. Congrès d' Urologie,* 1905. According to Croybel and Raffin sarcoma is seen in two forms, multiple and single. Two periods of life, before 10 generally multiple—50 to 70 generally single. Death rate, quoting Croybel who quotes Differins, 57 cases operated, 45 died at once, eight returned, four nealed. Raffin, 22 cases, two recoveries.

There are two cases of sarcoma in the writer's list, one already reported in the paper by Dr. Brooks and himself previously referred to, and another in their autopsical records collected since.

Sarcoma of the bladder following operation occasionally recovers and apparently the death rate is a little better than in cancer.

Regarding the causation of bladder tumors whatever theories may be held as to the finer differentiations of their cause, it seems to be agreed by many observers that previous inflammation is the most common causative agent. Concerning previous inflammation of the bladder statistics would seem to show that cystitis is as common in women as in men, if not more so. Therefore, one would naturally expect that bladder tumors would have the same frequency in the two sexes and not the existing discrepancies as is apparent from the statistics of Kuster, *Archiv. Klin. Chic.,* Berlin, 1891, 179 men to 86 women. B. Motz *Trans. Congrès d' Urologie,* 1898, found in 63 cases of tumors of the bladder causing death 60 in men, three in women.

These statistics tend to show how frequent a causative factor the prostate is in bladder tumors. Our article previously referred to showed disease of the nervous system a prime factor in causing bladder lesions, thus indirectly being the cause of tumor formations. Inflammation caused by work in aniline dyes, Bilharzia and stone in the bladder all play a part, and as stone and irritating conditions are so much more frequent in one part of the country than in another we may expect statistics concerning bladder tumors to be affected to some extent by the locality in which the observer lives.

Papillomata are, as we all know, the most frequent as regards the appearance of bladder tumors. Are papillomata as ordinarily seen in the bladder mutiple or single? Fenwick (*" Tumors of the Bladder,"* E. Hurry Fenwick, London, 1888) from an examination of the museums of Europe found 30% of papillomata multiple. Various statistics have been gotten up since the publication of Dr. Fenwick's article. Albarran, in the work re-

ferred to, says from 30 to 40 per cent. are multiple. Frisch, whose interesting article will be again referred to, states that one-half of his 201 cases of papilloma were multiple. Dr. Desnos, *Trans. Assoc. Française d' Urologie* 1905, out of 103 cases found only 25 with a pedicle that could be ligated. These show a higher proportion to be multiple than do the statistics of Frisch and Zuckerkandl who state 25% only are multiple.

There is no doubt but that multiple papillomata are extremely common, one of the causes being as noted by Albarran that through contact one portion of the bladder wall becomes infected from another, the top becoming infected from the side or from the bottom. The cases operated on by the writer in our collection of autopsical material show an overwhelming majority to be multiple. The writer has only seen one single bladder papilloma and that through the kindness of Dr. John van der Poel many years ago.

The writer is of the opinion that in forming the statistics of the frequency of bladder papillomata, as to whether they are multiple or single, a great deal depends on the class of cases which the observer most frequently meets with. The man who does a great deal of cystoscopic work will naturally see these tumors in the earlier stages of their formation, when they are probably more apt to be single, whereas the observer who runs across them ordinarily as surgeon to a city hospital, where many of the patients are elderly, or in cases that have been neglected, may expect to find a very large majority at least of the tumors he meets with in the bladder multiple growths. This has certainly been the experience of the writer. It may be desirable to dwell on this subject for a moment because it seems to have been somewhat overlooked in so many of the recent articles published within the last few years describing the best method of operating on bladder tumors. Any one not familiar with the subject reading the articles would think it comparatively easy to resect a portion of the bladder wall, remove the tumor, and that good results would follow, but when you have a large mass on the roof of the blad-

der, another one on the side; or when you have a flower garden growth at the base of the bladder; or when you have the side and roof of the bladder of an old man involved to such an extent that the thickness of the bladder wall is like parchment, all of which type of cases have been operated on by the writer, the problem of a resection, or of removal through an operating cystoscope is not a simple one.

Under such conditions each case has to be a law unto itself, the growths have to be removed by the best method one is able to employ, or the question of the removal of the entire bladder taken up.

Although it is foreign to the subject the writer wishes to state here, that as far as his present experience goes, it would lead him to prefer in severe malignant cases some radical operation in preference to the old-fashioned custom of introducing permanent drainage through a tube in a suprapubic opening in the bladder. From the observation of one such case which occurred in the service of a colleague, and was afterwards under his care, in which, although the bladder was not removed, permanent drainage was established through the pelvis of each kidney, a method advocated by Dr. Watson and others, he is inclined to think well of it in certain cases as a method of relief when there is no hope of cure.

Papillomata, as we know, may be malignant or benign growths. The following statistics are submitted: V. Frisch, (Bericht ueber 300 Operirt Blasen Tumoren, *Wien. Klin. Worchenschrift,* 1907. 1203-1207) in 201 benign papilloma found 107 showing signs of beginning carcanomatous infiltration. Another observer, Kuster, I think, related that of 28 tumors with pedicle 15 were malignant.

Can we tell through the appearance of a papilloma whether it is malignant or benign? If it is infiltrated it is malignant. We cannot always determine that. Benign tumors infiltrate upwards into the air; malignant tumors infiltrate downwards and send out their roots. Is there any value in the diagnostic point given by

some observers that on feeling the epithelium if it slips over the tumor it is benign? It may be true in some cases. The experience of the writer would show that it is of no practical value.

Then, too, islands of infiltration may exist in various parts of the bladder which cannot be discovered.

The prostate has been previously mentioned as being the most frequent cause of malignant growth of the bladder, even in cases in which apparently the prostate is not enlarged nor involved in the process. The work of Edward Montford, "Contribution à l'Etude du rôle de la Prostate dans le Production des Tumeurs Epitheliales Infiltrés de la Vessie," Paris, 1903) is most interesting, in this respect. In the examination of 78 epithelial tumors in men 27 or 35% showed cancerous extention from the prostate. He states that it may be necessary to make many sections through the prostate in order to discover the cancer. He naturally, while he does not absolutely dispute its occurrence, considers primary cancer of the bladder as very rare.

We may consider it probable that if in a woman a papilloma shows no evidence of infiltrations to the touch, and provided there are no indications of carcinoma in other portions of the body, the possibilities are strongly in favor of the growth being benign. Primary carcinoma can exist however in the bladder (a fact that has been disputed by some in the past). The writer is able to furnish a photograph of a case from the records of the Pathological Department of the City Hospital through the kindness of Dr. Dieffenbach. A case was found also in the autopsical records on which the paper referred to of Drs. Greene and Brooks, was based.

A microscopical examination at the time, of a section of growth removed at operation will not necessarily show its nature, and may be deceiving even if made later. In a case of the writer a man died three weeks following an operation for bladder tumor from some unknown cause, the clinical picture of whose case was cancerous. The microscopical examination of the growth failed to show anything but benign tumor. Similar histories have not infrequently been recorded.

The statistics regarding the result of operations are very confusing:

Clado and Albarran, death rate 44 per 100 malignant.

Clado and Albarran, death rate 7 per 100 benign, about the same as 30% of the malignant return, after prostatectomy; 20% of the benign.

Frisch: Death rate study of 300 operations of his own in 20 years. Death rate from malignant 25.3%; death rate from benign 9%. In 103 benign papillomas 53 could be followed; 32 remained cured; 95 cases of carcinoma, 62 reported, all have recurrence; longest time seven years, most recent from one, two and three years.

The following statistical table is a small one but it is a recent one, and is perhaps as lucid as some of the larger and more elaborate tables. It was given by Dr. Felix Legueu of Paris at the Surgical Congress in Belgium. (Dr. Felix Legueu, *Trans. 2me Congrès International de Chirurgie,* Bruxelles, 1908). He had operated by simple removal ten times for cancer of bladder; recurrence in all ten. Longest time 13 months. In one other case operated on, apparently cured, it has not returned in 2½ years. Two cases of partial resection did better. One did not come back until five years. The other had cancer right side, he came back 14 months after operation, cystoscope then showed a small growth at seat of old cancer. Eight months afterward bladder was re-opened and a small tumor there found microscopically to be benign, was removed; six months later a cancer returned on left side.

The above case is interesting as it tends to show that a benign tumor may form on the seat of a previous malignant one. It is, of course, a well established fact that a malignant bladder tumor will often form on the seat of a benign one. An interesting question which arises is the value of the procedures under the operating cystoscope. Nitze's figures are as follows:

Out of 103 benign papilloma, after three years, 71 had not returned; 18 had; 12 not accounted for. (From M. Weinrich, *Trans. Assoc. Française d' Urologie,* 1905).

When we consider as shown by the work of E. Montford previously referred to the frequency of extension of cancer of the bladder from the prostate, it would seem to indicate that in doing a radical operation, if practical, the prostate as well as the bladder growth should be removed. This might furnish a larger field for the operation for the so-called amputation of the neck of the bladder.

Conclusions.

First: The most frequent cause of bladder tumors is previous inflammation, direct cystitis being the cause of bladder tumors in women when not due to transmission in that sex from neighboring organs, or they are the indirect results of previous inflammations in the prostate in men, which in a considerable proportion of cases in the latter eventually goes on to the formation of malignant growths with subsequent bladder involvement.

Second: From the nature of the tumors themselves, the operative procedure should be attempted. Probably simple removal for benign papilloma, patient to be kept under observation, resection and in addition removal of prostate when possible, if evidence of malignancy is present in men.

Third: To obtain better ideas as to the nature and progress of bladder growths there is great need of statistics, not larger in number, but of cases in which more accurate clinical histories are made, the patient observed for a longer period of time, or autopsical evidence of a more thorough character showing not only the condition of the diseased viscus, but the result of sections made through other organs of the body.

Fourth: Through an increased knowledge of their pathology obtained through the statistics of carefully reported cases, and through the increased refinements in diagnosis, such as are being made possible by the more frequent use of the cystoscope, we may hope in the near future to have data at our command which will much facilitate the work of the surgeon in determining the proper procedure to adopt in dealing with the various forms of this disease.

SPECIMENS FROM A TRANS-PERITONEAL CYSTOTOMY FOR CANCER. NO SIGN OF RECURRENCE AT END OF ONE YEAR

By ARTHUR TRACY CABOT, A. M., M. D., of Boston.

FIGURE 1 (Plate VIII) presents a large cancerous growth from the apex of the bladder, which had penetrated through all of the coats of the vesical wall and had attached itself to the omentum.

With it is shown (Fig. 2) the bladder from which this tumor was removed. This was obtained one year after the operation and shows no sign of recurrence.

The history is as follows:

C. E. S., a healthy, strong man of 55. In 1901 he had urinary symptoms thought to be due to stricture for which he was treated and in July of that year he had a cystitis (?) followed by the appearance of mucus with sometimes small quantities of blood in the urine. The blood appeared at this time as streaks in the mucus. This mucus came in the first part of the urine and also in the last part.

A difficult stool also pressed out some of this mucus.

There was no pain except occasional slight discomfort at end of penis felt towards night, and there was no increased frequency of urination.

In 1902 he had instillations of a solution of nitrate of silver (5 grains to the ounce) into the prostatic urethra, which were followed by a cessation of all discomfort and an almost complete disappearance of mucus; a few clumps only being seen in the first part of the urine.

In 1904 he was seen once and a 28 French sound was passed easily. Further examination was planned, but he did not return until February, 1908. He then reported that blood had appeared intermittently since the last visit, sometimes of late in considerable amount. A cystoscopic examination showed the existence of a tumor in the upper part of the bladder.

He was operated upon immediately after this examination. Under ether a hard mass could be felt above the pubes.

The suprapubic incision was enlarged upwards into the peritoneal cavity as far as the umbilicus and the omentum was found adherent to a mass as large as a hen's egg, which projected from the bladder wall. The omentum was tied off about two inches above the growth and divided with scissors. The tumor was then cut out with a margin of one-half an inch of healthy bladder wall all around. This removed what seemed to be rather more than one-half of the bladder.

The bladder was closed by a continuous suture of chromic gut which included all its walls. The peritoneal surface was then rolled in over the line of suture with a number of interrupted linen stitches. The omentum was lightly attached over the bladder wound, a drainage tube was secured in the outer end of the bladder incision outside of the peritoneum, and a small cigarette wick was laid within the peritoneal cavity just outside of the omentum, which covered the bladder wound. The rest of the wound was tightly closed.

The patient's recovery was as uneventful as after an ordinary suprapubic cystotomy. Within two months he had resumed the life of an active man, and his urination was easy, once in three or four hours, and two or three times at night.

In August he was seen and he then felt as well as ever in his life.

The pathological report upon this tumor was as follows: The tumor is a typical carcinoma, merging in the portions adjacent to the cavity of the bladder into a papilliferous adeno-carcinoma. The cells of the tumor are very atypical. (Signed James Homer Wright).

Everything went well and urination was normal through the summer and autumn until in Jan., 1908, Mr. S. was suddenly seized with pneumonia and died after a short illness.

The bladder was taken out and sent to me.

As you see in the specimen it presents a smooth, unbroken mucous membrane with no sign of recurrence in its wall. The

scar of the operation can only be detected by a slight thinning of the wall at that point.

This case is a good illustration of the slow development of cancer in the bladder and of the possibility of its complete removal when it is situated at the apex of the bladder.

It was very noticeable that, although one-half of the bladder had been removed, the power of retaining urine was restored almost to what is normal in patients of that age.

REPORT OF A CASE OF VESICAL DIVERTICULUM CONTAINING A CANCER

By Hugh H. Young, M. D.

On February 5, 1909, a patient (C. D., No. 2089) presented himself complaining of hematuria. He was 70 years of age, married, and a practicing physician. There was no family history of cancer and the past history was negative.

About three months before admission he noticed for the first time a small amount of blood in the urine, and after that it was almost constantly present, but not until six weeks later did he pass any clots. Soon after this he noticed small particles of calculus, and he says that if a clot remains on the bladder any length of time crusts of urinary salts will form on it and it will scratch the urethra when passing out. He has had no increase in the frequency of urination, but on account of a desire to prevent the formation of large clots he usually voids about every two hours. His general health has remained good, and he has lost no weight. The urine is almost constantly blood and clots of large size are frequently passed. He has had no pain in the region of either kidney and aside from the hematuria has been remarkably comfortable. No pain in the rectum or perineum.

Examination. The patient is a tall, thin, rather pale looking man. The heart and lungs are negative. There is no enlargement or tenderness in the region of either kidneys or bladder. On rectal examination the prostate was normal in size, smooth,

slightly firmer than normal, but not nodular nor adherent. The seminal vesicles were normal but between them on the posterior wall of the bladder about 2 c. m. above the upper end of the prostate a smooth globular hard mass was felt. It gave way on pressure. The surrounding structures were soft and no indurated cords or glands were to be felt. The rectal wall was normal and the globular mass above described seemed to involve the bladder wall. A coudé-catheter passed with ease and showed 60 c.c. residual urine, and a bladder capacity of 340 c. c. There was considerable hemorrhage and it was impossible to get the bladder clean of blood, so that cystoscopic examination was not entirely satisfactory. A study of the prostatic orifice showed a slight elevation of the median portion of the prostate, but the lateral lobes were not enlarged.

To the left of the cystoscope a large irregular, globular, black mass was seen. It was not villous in type, but was somewhat lobulated and the surface was fairly smooth. The base could not be seen, but it was supposed to be in the region of the left ureter. The cystoscopic examination was greatly interfered with by the presence of bloody fluid so that the views obtained were not clear, but I came to the conclusion that I was dealing with a large globular tumor which had become black from necrosis, and that it was probably malignant in character. No other tumor was seen.

It was thought advisable to obtain a section of the tumor for microscopic study, and accordingy the "cystoscopic rongeur" recently devised by the writer, was introduced and a portion of the tumor grappled and apparently removed. When this was brought out with the instrument I was surprised to find only blood clot in the jaws of the rongeur. There was no trace of tissue, but the blood clot was evidently very old and very black. I was greatly disappointed at not obtaining any tumor tissue and therefore attempted two days later to obtain some again by operative cystoscopy, but with similar results.

I therefore decided to perform an exploratory cystotomy, and on February 11, 1909, this was done, under ether. On opening

the bladder a large mass of black organized blood clot was found, but after removing this a splendid view of the entire bladder was had and no sign of tumor was to be seen. The ureters were normal, and were secreting clear urine, and the vesical mucosa looked perfectly healthy. I was never so disappointed in my life and was about to close up the bladder when I noticed a pin point area of hemorrhage on the posterior wall of the bladder, slightly to the left of the median line and about 2 c. m. behind the orifice of the left ureter. With a fine probe I found that this led into a diverticulum about 2 c. m. deep. The orifice was then dilated and a small clamp inserted to explore the cavity of the diverticulum, and when it was withdrawn a bit of tumor tissue was found between the jaws. A hasty frozen section showed this to be carcinoma, and a complete excision of the diverticulum was decided on. The prostatic tractor was first inserted into the cavity and opened out, thus furnishing an excellent means of making traction upon the diverticulum. A circular incision 2 c. m. in diameter was made through the vesical wall around the orifice of the diverticulum, and then by blunt dissection the sac was rapidly freed from surrounding structures until the deeper portion was reached, where the peritoneum was found very adherent. Accordingly an area of peritoneum about 3 c. m. in diameter was excised with the diverticulum which was globular in shape and about 4 c. m. in diameter. The patient was in an exaggerated Trendelenburg position and a good view was obtained of the pelvic cavity. The ampuella of the vas deferens and the upper end of the seminal vesicle were located. No glands or lymphatics were to be found and the tissues around the diverticulum seemed healthy. An examination of the sac showed that the tumor had not penetrated its wall and that the operation had apparently been complete.

The peritoneum was then closed through the bladder with a continuous catgut suture, which was easily placed. The vesical wound was approximated with interrupted mattress catgut sutures.

The cystotomy wound was also completely closed with a continuous Connell suture of catgut, and the recti muscles and

fascia were brought together with interrupted silver sutures, leaving a small area at lower end for gauze drainage of the prevesical space.

A large rubber catheter was fastened in the urethra for continuous drainage. The condition of the patient at the end of the operation was good, and the convalescence was uninterrupted. The vesical wounds healed without leaking, the retained catheter was removed after 12 days, the suprapubic wound granulated well and the patient was out of bed on the seventeenth day, and he was discharged from the hospital on the thirty-second day after the operation in excellent condition, voiding urine freely at good intervals.

I have recently received word that he is in excellent condition, urination normal, no recurrence of hematuria.

I have not as yet found any similar case recorded in the literature and in many respects the case above detailed appears to be unique.

It demonstrated to me the surprising ease with which diverticula, which project intraperitoneally, can be removed, and also that the peritoneal cavity can be most readily closed through the bladder in this way.

It brought up to my mind whether it would not be better to attack malignant tumors involving the base of the bladder and the peritoneum, by cutting from within through the bladder wall into the peritoneal cavity rather than through the abdomen as suggested by Harrington, Mayo and others. The pelvis is emptied by an exaggerated Trendelenburg position and I believe the peritoneal and vesical wounds are smaller and easier to close by this intravesical route.

The surgery of vesical diverticula is one of increasing importance. I have recently had two cases of multiple diverticula with encysted calculi which were very puzzling in their symptoms, until radiographs showing large extra-vesical calculi in diverticula the minute orifices of which had been seen with the cystoscope were obtained.

It does not seem sufficient to simply enlarge their orifices and extract the calculi, because the nidus remains and calculi are

apt to recur. Large diverticula should be shelled out intravesically and with suitable intra-diverticular traction this is easily accomplished. The fact that diverticula are apt to occur in the region of the ureteral orifices, and frequently lead to hydronephrosis from pressure upon the ureter is another cogent reason for their extirpation in certain cases.

Not infrequently the ureteral orifice is drawn into the diverticulum, but in such cases by a simple plastic operation the ureter can be brought back to the bladder in closing the wound, after excision of the diverticulum, as shown in a report on the subject in Vol. XIII, *Johns Hopkins Hospital Reports,* 1906.

SOME OBSERVATIONS UPON TOTAL EXTIRPATION OF THE BLADDER FOR CANCER

By Hugh Cabot, M. D.D, of Boston.

THE following case is reported as tending to throw some light upon the problems in connection with radical cure of cancer of the bladder and also for its interest as showing the simultaneous occurrence of non-malignant papilloma of the bladder and cancer of the prostate. I am indebted to the courtesy of Dr. C. A. Porter and Dr. W. M. Conant, in whose services the patient was while in the hospital, for the privilege of reporting the case.

P. J. C., aged 38. Born in Newfoundland, living in Brockton, Mass.

June 10, 1909. Service of Dr. C. A. Porter. Previous history negative. Moderate drinker and smoker.

Previous Illness. Five years ago noticed a little blood in the urine with slight frequency of urination. Hematuria continued with slight intermissions to the present time. Never excessive. Slight continued frequency of urination, no loss of weight or strength.

Physical Examination. Strongly built, fat, healthy-looking man. Examination negative except for bladder.

Cystoscopy, H. C.

In the region of the left ureter probably to the outer side is a soft pedunculated growth not villus. No evidence of infiltration seen about base.

Rectal examination by Dr. Porter. "Prostate not enlarged, fairly firm, no groove made out between lobes."

June 15. Operation by Dr. Porter. Ether. Exra-peritoneal suprapubic cystotomy. Papillomatous growth found posterior and external to the left ureter. This was removed with good margin and base of wound sutured with No. 00 plain cat gut. Ureter not damaged. Bladder wound closed in layers with cat gut. Gauze drain down to the bladder wound. Rest of the wound partially closed. Urethral drainage. Convalescence complicated by excessive ileus and severe hiccough. Urethral drainage efficient. Suprapubic wound closed without leakage. Discharged July 3.

October 3. Cystoscopy showed apparent evidence of recurrence and examination was followed by frequent and urgent urination.

October 23. Re-entered hospital in service of Dr. W. M. Conant.

Urine clear until the latter part of September, when hematuria returned.

October 28. Cystoscopy, H. C. Bladder much contracted holding only two and half ounces. Examination painful and difficult. A red easily bleeding mass was seen on the left side close to the internal urethral orifice. This was believed to be a recurrence and total extirpation of the bladder was advised.

December 28. Re-enters for operation. Since leaving hospital was comfortable until one week ago, when he had sudden severe pain in the perineum and rectum lasting five minutes. During the last week has similar pain with each micturition. Slight terminal hematuria. Has gained weight and strength and is in excellent condition. The prostate by rectum was hard, tender, outline somewhat obscured and merged above in a firm infiltration extending backward as far as the finger could reach. Prostate not enlarged.

PLATE VIII.—Presented by Dr. Arthur T. Cabot.

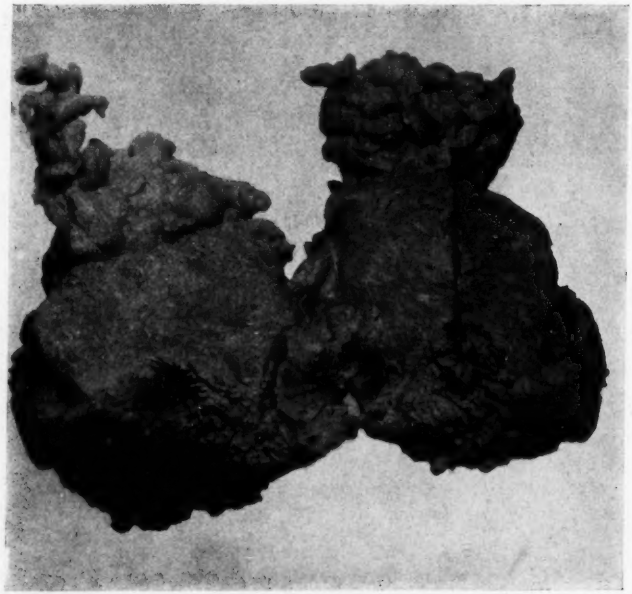


Fig. 2

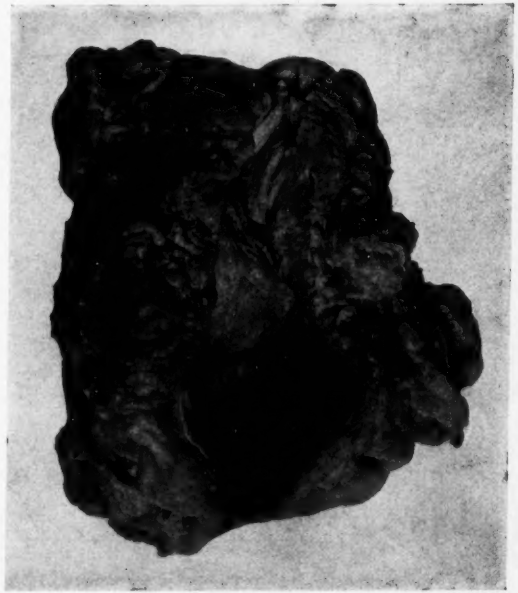


Fig. 1.

Fig. 1. Shows the cancerous growth laid open by an incision through the middle. Below is the papillomatous surface that projected in the bladder. Above is the adherent omentum and between lies the hard glistening cut surface of the cancer.

Fig. 2. The bladder opened in the middle line in front down through the prostate. Below is the neck of the bladder and above is the thinned apex from which the cancer was removed. The mucous membrane was smooth throughout with sift elastic wall.

January 4, 1909. Operation. Dr. Cabot. Ether. Bilateral lumbar nephrostomy. On the left side a vertical lumbar incision was made at the outer border of the quadratus lumborum. Owing to the thick muscles and large amount of fat the kidney was isolated with difficulty and could not be brought up into the wound. An incision was made through the cortex of the kidney at about the junction of the lower and middle thirds. The finger was then pushed through the kidney substance until it was apparently in the pelvis, but it was very difficult to be sure when pelvis had been opened. Ureter tied with Pagenstacher just below the pelvis and divided. Rubber tube placed in the wound in the kidney and held in position with mattress sutures through the substance of the kidney. Gauze drain to stump of ureter. Wound partially closed in layers.

Right kidney exposed through an oblique para-peritoneal incision. This route made the exposure of the kidney much less difficult. Kidney treated as on the left.

A rather stormy convalescence, complicated as was his previous operation by distention and marked hiccough. Kidney drainage not very satisfactory but by the end of a week was working fairly well. Tubes tended to slip out of kidney substance when drainage became insufficient and slight uremic symptoms came on. On the twelfth day after the operation patient markedly uremic on account of insufficient drainage. Tubes removed, wounds in kidneys dilated and satisfactory drainage obtained. From this time on drainage was satisfactory.

February 2. To-day for the first time an abscess was noticed in the perineum which had all the appearance of a periurethral abcess. It was incised under nitrous oxide anesthesia and one-half ounce of foul pus evacuated. It seemed not improbable that the basis of this was an extension of the growth forward.

February 10. Operation. Dr. Cabot. Gas, oxygen and anesthol anesthesia. Dr. Kidner. This anesthesia was employed on account of a very troublesome distention which has followed on both occasions when ether was given.

Total cystectomy. Patient in Trendelenburg position.

Median incision from umbilicus to pubes. Peritoneal cavity opened and peritoneum was stripped off the posterior bladder wall. This was done without difficulty. Ureters readily found and divided. Very moderate bleeding from vessels in region of the ureters Bladder readily freed by blunt dissection and removed with most of the prostate. This was found to be infiltrated with cancer and part of it was left behind. As much as possible was removed with a curette, but anterior wall of the rectum appeared somewhat involved.

Excellent recovery from ether with none of the symptoms which had occurred before. Notable absence of shock and general disturbance. Kidneys drained nicely. Suprapubic wound closed rapidly; a tube with which it had been drained being withdrawn through the perineal wound.

March 24. Patient decided to go home though his perineal wound was still open and nephrostomy wounds were not draining satisfactorily through the tubes, though the amount of urine excreted was ample. Heard afterwards that patient died suddenly a week after leaving hospital. Cause of death unknown.

Pathological report by Dr. F. C. Kidner, June 15, 1908.

The first specimen submitted was a villus-like growth about 1½ cm. in greatest diameter. It had a small pedicle ½ cm. across. Surrounding the base of the pedicle was a small amount of mucous membrane of the bladder. The specimen is said to have been removed from a point just behind and to the outer side of the left ureter. The gross appearance of the tumor was that of a papilloma with rather heavy thick branches.

Microscopical examination of this specimen showed infinitely branching villi covered with many layers of stratified epithelium. The cells were rather small and in the deeper layers markedly columnar in appearance. Towards the outer surface they became much flatter and more pavement like. The stalk of each villus consisted of a very small amount of delicate fibrous tissue containing many unusually large blood vessels. Section through the base of the tumor at right angles to the surface of the bladder showed the muscle of the bladder wall and a little of its mucous

membrane, from which the papilloma sprouted directly. The vessels in the muscle were very large and dilated, and there were one or two hemorrhages. There was no apparent tendency of the epithelium to infiltrate the base of the tumor. The whole tumor had been removed. The specimen was a type of bladder papilloma, with unusually thick epithelial covering.

The second specimen received February 10, 1909, was a bladder with about 3 cm. of each ureter, and part of the prostatic urethra, which was surrounded by hard prostatic tissue. The bladder was contracted and when opened showed the mucous membrane thrown into folds and ridges but not markedly inflamed. The cavity of the bladder showed no macroscopical sign of tumor of any sort. On laying open the wall of the prostatic urethra it was found to be thick, rather hard, and to contain numbers of grayish, cellular areas.

In the bladder no scar of incision of the polyp, removed six months before, was to be found. Sections were taken at the described site of the polyp and the muscle and mucous membrane were everywhere normal, excepting for such thickening as would be expected in the contracted condition of the bladder, and for a certain amount of round cell infiltration and œdema of the submucous coat. In one of the sections was found a microscropic polyp exactly similar to the one removed in June 1908. There was no malignant infiltration of the bladder wall.

Sections from the wall of the urethra showed in the constrictor muscle marked inflammatory changes and increase of fibrous tissue. As the distance from the bladder increased there appeared large collections of large epithelial cells showing mitotic figures, similar in every way to those from the third specimen, taken from the perineum. No prostatic tissue however could be found. An attempt was made by taking a long section, to trace this malignant disease to the mucous membrane of the bladder. This showed the normal bladder wall, then the bundles of muscle of the constrictor, and at some distance in the site of the normal prostate appeared fibrous tissue infiltrated with cancer.

The third specimen was removed from the perineum of the same patient in March, 1909. It consisted of a bit of ragged tis-

sue about 1 cm. in diameter removed from the region of the prostate. It was fibrous in character and covered with granulations.

Microscopical examination showed fibrous tissue, markedly inflamed, scattered through a part of which were numerous atypical prostatic glands. These were irregular in shape and usually dilated. The epithelial lining consisted of rather small cells and there was a marked tendency to exfoliation and destruction of the gland walls. In fact, many of the individual glands showed complete breaking through of the epithelium into the surrounding fibrous tissue. At one side of the specimen, in close relation to these glands, appeared a few large epithelia, in small groups of one to five or six cells. In a few places a direct relation between the broken down epithelium of the glands and this free epithelium could be made out, and transitional forms from the small ovoid cells of the glands to the larger irregular, less clearly cut cells of the new growth could be made out. As the distance from the glands increased the epithelial masses became larger and larger until finally the whole tissue consisted of a mass of large, irregular, atypical, epithelial cells supported by a delicate fibrous tissue mesh-work, densely infiltrated with round cells. The individual cells had large vesicular nuclei and indefinite eccentrically placed rather homogeneous protoplasm without definite cell boundary. These cells in no way resembled those seen covering the villi of the previous specimen. This was evidently a part of a cancer of the prostate, of the so-called scirrhous type.

From the pathological standpoint this case is interesting, because of the existence of two independent conditions in which the symptoms of the first, but less important—the polyp—masked those of the second—the malignant prostate. There is evidently no anatomical or pathological connection between the two diseases. The cancer of the prostate in consideration of its state of advancement must have existed at the time of the first operation.

Microscopical examination of the last specimen would lead one to think that the clinical symptoms from the prostate itself would have been very slight or negligible, for the lumen of the urethra was of good size, there was no projection of the prostate

into the bladder, and from the amount of tissue removed it was apparent that the prostate could not have been large. The appearance of the minute papilloma at about the site of the previously removed tumor in the bladder is interesting. Whether this would have gone on to dimensions necessitating its removal is, of course, impossible to say. It certainly suggests a recurrence"

This case throws some light upon the problems of total cystectomy for cancer, even though it was undertaken without full knowledge of the condition and failed to cure the patient.

Watson and other observers have called attention to the fact that in total removal of the bladder there are two distinct problems. First, the diversion of the urine, and second, removal of the bladder. My own experience, limited to two cases of total extirpation, has made it clear to me that the problem of dealing with the urine, whether by transplantation of the ureters or by nephrostomy, is really the essential part of the operation.

Two general methods are at our disposal, as above stated. Watson has strongly advocated nephrostomy—and in this view he is supported by Albarran—on the ground that the ultimate function of the kidney is thereby better preserved by the lessened liability of infection. If this view is born out by further experimental and clinical study, it will go far to settle the question, as it is by the essential integrity of their kidneys that these patients must stand or fall. On the other hand bilateral simultaneous nephrostomy is an operation of considerable gravity and one presenting some technical difficulties. The present case was one of unusual difficulty, because by reason of the thickness of the overlying tissues and the rather short kidney pedicle, the organs could not be brought up into the wound and the operation upon the kidneys had therefore to be carried out at a disadvantage. I am clear that in cases of this type the anterior so-called paraperitoneal incision gives distinctly better access to the kidney than the lumbar incision. After the drainage of the kidney has been established a small conveniently-placed lumbar incision can be made so that the tube in the kidney comes out directly through the loin and the anterior wound can then be closed. The most difficult

part of the operation in this case, the kidneys being normal without dilatation of the pelvis, was the difficulty in determining with certainty that the tube was actually placed in the pelvis. The anatomical size, shape and arrangement of the pelvis is so variable and in some cases it may be so small as to greatly complicate the operation. On one side I divided the ureter four or five inches below the pelvis and injected the pelvis with salt solution, thereby distending it and much facilitating the accurate adjustment of the drainage. I find that this manœuvre has been favorably commented upon by Albarran. Where the kidney is deeply placed and relatively inaccessable this preliminary dilatation of the pelvis will be found a distinct aid. It is clearly important that the technique should be simplified in every way with a view to lessening the time of the operation.

The employment of the ureters in the diversion of the urinary stream has been perhaps the more commonly adopted method. Insertion of the ureters into the bowel at any point is practically not applicable to this condition, since it is never possible to take a piece of the bladder wall with the ureters, and in most cases the lower portion of the ureter at least should be removed with the bladder. Thus, if the ureter is to be used it must practically be brought out onto the skin at some point. If brought to the surface at the side abdominal wall it will be less likely to become kinked than if brought out posteriorly. On the other hand in the anterior position it is almost impossible to adjust any apparatus that will keep the patient dry, and unless this can be done the resulting condition is so uncomfortable as to defeat the object of the operation. If the ureter is brought out posteriorly it can be more readily drained and it will perhaps be possible to keep the patient dry. On the other hand it bends the ureter sharply backward at its junction with the pelvis and is likely to result in some obstruction and to increase the probability of infection. On the whole I am inclined to agree with the view expressed by Watson —that nephrostomy is the more satisfactory procedure and when skillfully done will give good results.

The second step of the operation, the removal of the blad-

der, should be undertaken at a separate sitting. Both technically and as regards the amount of shock it is far easier than the diversion of the urinary stream and is really a perfectly simple operation. In my two cases it has been wholly devoid of difficulty and the bleeding which is mentioned from the peri-prostatic plexus of veins, has been wholly insignificant. I think that it is easier to begin the operation with a median perineal incision, as for prostectomy, dividing the membranous urethra, freeing the prostate from the rectum and pubes and then packing the wound with gauze. A free median transperitoneal abdominal incision is then made, the peritoneum separated from the posterior bladder wall down to the region of the ureter and then closed so that the abdominal cavity is no longer exposed to the danger of infection. From this point the operation can be finished in a very few minutes by rapid blunt dissection and I do not believe that hemorrhage need ever be troublesome.

As a purely side issue this case is of considerable interest as showing the simultaneous presence of a benign tumor of the bladder and a malignant tumor of the prostate. I am somewhat chagrined at having overlooked the condition in the prostate, but feel that the mistake was a natural one. The inflammatory condition in the prostate which not infrequently accompanies the cystitis seen with tumors of the bladder is not easily distinguished from the early condition in cancer of the prostate.

Dr. Kidner's report makes it clear that the two growths bore no relation to each other, and it is not probable that simultaneous occurrence will be seen often enough to vitiate the results of total cystectomy as it did in this case.

THE DIAGNOSIS AND TREATMENT OF VESICAL TUMORS. DEMONSTRATION OF A NEW OPERATIVE CYSTOSCOPE

By HUGH HAMPTON YOUNG, M. D., Baltimore.

IN 1901 Nitze reported operations upon 84 cases of tumor of the bladder. All of these operations were done by his method of operative cystoscopy with the snare and cautery. Examinations were made with the microscope of the first tissue removed and showed that in four cases the tumor was malignant. On these cases no further cystoscopic operative work was done. In the remaining 80 cases, the tumor was benign and endovesical cystoscopic operations were repeated until the tumor had been completely removed. Of these 80 cases Nitze states that there were only seven in which recurrence occurred—four in situ and three elsewhere. This gives 91% with no recurrence.

In 1905 Nitze had operated upon 101 benign cases, of these 12 were not followed. There was no recurrence in 71, or 80%, and a recurrence in 18—of which only nine were in situ.

At the German Surgical Congress in 1907 there was a lengthy discussion of the operative treatment of vesical tumors.

Lichtenstein reported two cases of single papilloma, clinically and microscopically benign, in which a complete suprapubic excision was performed. In both cases there was a recurrence of tumor growth in the suprapubic scar and at a second operation, undertaken inside of a year after the first operation, the recurrence was found to be carcinoma.

Casper mentioned seven cases of benign tumors operated by suprapubic excision in all of which there was a recurrence, and he took the deliberate stand that all cases of benign vesical tumor should be operated endovesically. He advised both the cystoscopic snare and the injection of resorcin into the tumor through a long needle which could be used with a catheterizing cystoscope.

Frank strongly advised the use of resorcin, saying that he injected a 10% solution into the bladder, and that in one case a

large vesical tumor had disappeared completely with the resorcin treatment alone.

Stein said that he had operated upon 10 cases by sectio alta and that in each case he had excised the tumor with an area of sound mucosa, but in all cases there had been a recurrence, not in situ, but elsewhere in the bladder, and that the microscope showed all the recurrences to be carcinomatous.

Cohn reported a case in which he had removed one tumor suprapubically, and in three weeks after healing of the wound the cystoscope showed 15 shaggy tumors in the bladder.

A glance at the literature shows a very general disappointment in the results obtained by suprapubic excisions of vesical tumors which are clinically benign.

The following case is an example of results frequently obtained after very careful and very radical operations:

On August 16, '05, the patient (A. S., No. 1010, aged 49), presented himself complaining of hematuria. Cystoscopic examination showed a large villous tumor springing from a narrow pedicle in the region of the right ureteral orifice. Suprapubic excision of the tumor was performed, during which great care was taken to do a radical operation and to prevent any of the villi from being left in the wound. By making traction upon the tumor, which was clamped across its pedicle, the vesical mucous membrane was drawn well up from the bladder and when excised with scissors left a large denuded area in the region of the right ureter. Examination showed that about one cm. of the ureter had been excised with the pedicle of the tumor. As there were several bleeding points these were caught with long clamps which were left in place and the bladder was closed partly around these, which were removed on the following day. The patient made an uninterrupted convalescence and remained well for nearly three years, when he again began to have hematuria. He presented himself on May 11, '08, and the cystoscope showed a small contracted scar and a gaping ureteral orifice in the region from which the tumor had been removed, but there was no evidence of recurrence in this place. On the right lateral wall of the bladder

about 1.5 cm. distant from the ureteral orifice was a small villous tumor. On the anterior wall in the median line was a second tumor, probably in the region of the suprapubic wound, and on the left lateral wall is a third tumor. The location of these tumors, which were villous in character and attached to the bladder by short pedicles, suggested that the one on the anterior wall of the bladder had recurred in the suprapubic excision, and those on the lateral wall at the two points of pressure made by intravesical retractors at operation. The patient was quite a fat man and not in good condition for operation, and it was thought advisable to attempt to remove the recurrent tumors by means of the Nitze snare operating cystoscope. At the first attempt the patient complained considerably of pain and great difficulty was experienced in engaging much of the tumor with the snare. At three subsequent sittings, repeated at intervals of several weeks, bits of tumor tissue were removed, the total aggregate of which was a mass probably 2 or 3 cm. in diameter. There was still, however, considerable tumor tissue left in the bladder, and it was evident that it would not be possible by means of the Nitze snare to remove all of the tumor. On that account an attempt was made by means of a lithotrite to break off and extract more of the tumor tissue, but with very little success. The operator then decided to construct an operating cystoscope which would consist of two portions with separable blades somewhat like a lithotrite, but which when drawn apart would cause a concealed knife to come into view and stretching from the tip of one beak to the tip of the other, could be utilized to cut off a pedunculated vesical tumor (Plate IX, figs. 1, 2). This instrument was designed to carry a small straight cystoscope (Leiter-Kollmann cystoscope about No. 16 French in size) so that the intravesical operations could be conducted under the view of the operator.

The instrument was so arranged that the internal blades or beaks could be drawn apart by a screw arrangement externally.

With this instrument, under local cocaine anesthesia, a renewed attack was made upon the large tumor on the anterior wall of the bladder, and no difficulty was experienced in pushing the

PLATE IX.—Presented by Dr. Hugh H. Young.

Fig. 1.—Cystoscopic scalpel closed ready for introduction.

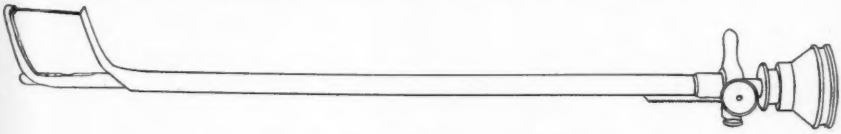


Fig. 2.—Cystoscopic scalpel with blades drawn up ready for use by separation of blades. Cystoscope pushed home, viewing the knife.

Fig. 3.—Intravesical rongeur with obturator closed ready for introduction.

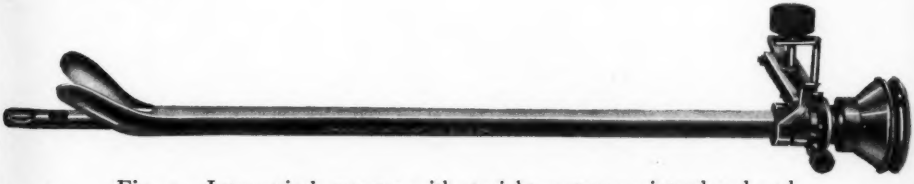


Fig. 4.—Intravesical rongeur with straight cystoscope introduced and cutting blades separated by external screw mechanism. Cystoscope held upon a mark by special attachment.

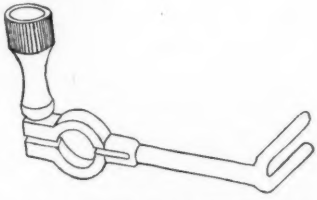


Fig. 5.—Special attachment for holding the cystoscope upon the mark. (Unintentionally enlarged view.)

little knife up against the pedicle of the tumor, and by quick rotary movement, the tumor was excised and then caught between the two beaks of the instrument and extracted with it. The amount of tissue thus removed was fully double that which had been excised in numerous attacks with Nitze snare cystoscope. The instrument is smaller than the Nitze cystoscope and its operation is much more simple. Subsequent experience with this instrument showed that it was not satisfactory for all portions of the bladder, and it occurred to the operator that an instrument constructed like a rongeur, which would carry a cystoscope and the blades of which could be opened and closed by means of external handles somewhat similar to our prostatic tractor, would be of more value in certain cases. After considerable experimentation the instrument shown in Figs. 3 and 4 was developed and made by the Willms Surgical Instrument Co. As shown in these illustrations the instrument consists of an inner and outer tube which permits of the introduction of a No. 16 straight cystoscope. On the inner ends of these tubes two rongeur blades are fashioned, so that when drawn together by handles at the other end of the tubes their cutting edges are accurately and forcefully approximated. The inner surfaces of these blades are sharp cutting edges down to the shaft of the instrument. The posterior surfaces are cut away in their lower halves so as to provide better view of the anterior edges of the rongeur and thus enhance the accuracy of execution in using the instrument. The external handles are operated by means of a central screw working beween its parallel parts, the inner surfaces of which are provided with teeth to fit the cogs of the central screw, Figs. 3 and 4. This mechanism provides an accurate method of opening and closing the internal jaws. In using the instrument it was found that the cystoscope would turn with the internal tube which immediately surrounded it (as was to be expected) and therefore that when an attempt was made to bring the jaws of the instrument together upon some tumor or foreign body, the rotation of the cystoscope and consequent change in the cystoscopic picture would prevent any accuracy of operation. A simple apparatus was then devised, as

shown in Figs. 4 and 5, by which the cystoscope was made to conform to the position of the operating screw, which, as will be seen at a glance, necessarily occupies always a point midway between the two external handles which connect with the inner and outer tubes respectively. By this simple means the rongeur blades are made to meet always in the center of the field so that no difficulty is experienced in accurately engaging any desired object in the bladder. (It has been a common fault of nearly all operating cystoscopes that when the blades or beaks are approximated they would move out of the center of vision, thus rendering accurate operations extremely difficult and often making it impossible to pick up a foreign body.)

The size of the instrument as completed is about 26½ French and is sufficiently powerful to grapple and remove tumors and prostatic outgrowths and even small calculi. It should usually be introduced with an obturator, after which the bladder can be easily washed out with the irrigating attachment. The cystoscope can then be introduced and pushed outward into the bladder until the beak of the instrument occupies the middle of the field. The relation of the cystoscope is then fixed by tightening the screw of the attachment which connects it with the large screw operating between the two external handles, and the instrument is then ready for use, and the operator may be sure that whenever the blades are brought together they will be in the center of the field of vision.

A few uses to which this instrument has been put may be of interest here and the cases will be briefly outlined.

Case 2, No. 2038, H. J. S., 58 years of age. Admitted December 1, 1908, complaining of hematuria.

Cystoscopic examination showed an irregular tumor in the left half of the bladder, irregularly lobulated, dark red in color and with no villi. In order to make a diagnosis as to its character the rongeur operating cystoscope was introduced and a piece 1x1x2 cm. easily removed. Microscopic examination showed that the tumor was carcinomatous and on January 27, '09, the patient returned and a radical excision of the bladder wall surrounding

the tumor was carried out. The bladder was closed with sutures and the patient convalesced well, leaving the hospital within six weeks with the wound closed and voiding naturally at intervals of two hours. Accurate knowledge as to the character of the tumor before operation in this case made it possible to carry out at once a radical operation without delay.

CASE 3, No. 1999. S. N., 73 years of age.

Complaint: "Frequency and difficulty of urination and of late hematuria." There was considerable hesitation of urination and when clots were present it was sometimes impossible to void.

Examination with the cystoscope showed a small rounded median prostatic obstruction with slight lateral lobe enlargement. In the left half of the bladder was a large irregular tumor which occupied the left half of the trigone and a large portion of the left lateral wall of the bladder. It was reddish in color, fissured, irregular and in places short villi were seen. With the rongeur cystoscope a large piece of the tumor was removed and submitted to microscopic examination. It was found to be entirely carcinomatous, and owing to the extensive involvement of the base of the bladder and the age of the patient it was thought unwise to attempt a redical removal. It was evident, however, that the median prostatic lobe was causing considerable obstruction, particularly when clots were present, and on this account a Bottini operation was performed to enlarge the internal prostatic orifice, and facilitate the escape of clots. This operation was remarkably successful and the patient has been quite comfortable, and although at times he has had considerable hemorrhage from the bladder he has at no time required catheterization as before and he has generally been quite comfortable.

CASE 4. No. 205. J. D., aged 65. Was admitted Aug. 9, '01, complaining of hematuria. Cystoscopic examination showed a large irregular villous tumor springing by a short pedicle from the region of the right ureteral orifice. The rest of the bladder was apparently healthy. Patient would not submit to operation then, but returned Jan. 1, '02, when suprapubic cystot-

omy was performed and the tumor excised. The bladder adjacent to the tumor was soft and the tumor did not seem to be malignant. The tumor was 5 cm. in diameter and connected by a pedicle about 2 cm. in diameter at a point apparently just internal to the right ureter, which, however, could not be seen. A long delicate curved clamp was used upon the pedicle close to the bladder wall and a Paquelin cautery was used in dividing the pedicle, leaving a depressed area in the bladder 2x3 cm. in size, in which the mucosa was exposed and several spurting vessels were seen, which were easily caught with hemostatic forceps. As the right ureter could not be found and the opening was somewhere in the immediate area the wound was not closed. On the left side of the bladder, external to the left ureteral orifice, a very delicate polypoid projection about 3 or 4 mm. in length and thinner than a small match was seen and destroyed with the Paquelin cautery. The bladder was then partly closed with sutures and the patient made an uninterrupted recovery.

On July 24, '02, patient was examined and no evidence of recurrence of the tumor was made out with the cystoscope. In the left half of the trigone a few small vesicles which were thought to be a cystitis bullosa were seen.

On March 4, '03, patient returned complaining of frequency of urination. The cystoscope showed the region from which the tumor had been excised to be normal in appearance and the rest of the bladder in a condition of a chronic cystitis, with no evidence of tumor anywhere.

On May 6, '04, the patient returned complaining of hematuria. The cystoscope showed in the left half of the bladder just external and posterior to the left ureteral orifice a papillary tumor of considerable size. In the region from which the first tumor was removed there was no evidence of recurrence.

A suprapubic cystotomy was performed and a vesical tumor 2x2x4 cm. in size, villous in type, with a soft base, and springing from a point in the region of the left ureter, was excised with its pedicle and the adjacent vesical mucosa. The left ureteral orifice could not be found and the hemostatic forceps were left in place.

The right half of the bladder, from which the tumor had previously been removed, was entirely healthy. The bladder wound was partly closed and the patient made an uninterrupted convalescence.

Cystoscopic examination six weeks later showed no evidence of intravesical tumor. On May 3, '07, patient reported that he was entirely well.

February 13, '09. Patient returned complaining of having had occasional chills. He said that he had had no urinary disturbance, no hematuria.

Examination of the prostate showed slight hypertrophy, and the cystoscope showed a small irregular villous tumor springing from the anterior vesical wall in the median line about the site of the old cystotomy wound. It lay about 5 cm. distant from the prostatic orifice and was apparently about 3 cm. in diameter. In the left half of the bladder with the pedicle in the region of the left ureter, was another tumor about 5 cm. in diameter. The right half of the bladder was still free from tumors. With the rongeur cystoscope a piece of tissue was removed and submitted to examination, which showed that the tumor was benign.

Since then three attacks have been made with the rongeur cystoscope and portions of the tumors have been removed. There is still more to be done. The two previous failures in this case discouraged the operator to again attempt to remove these tumors by suprapubic operation.

Other uses to which the rongeur cystoscope has been applied:

CASE 5, No. 2146. H. V., aged 55. Admitted about April 15, '09, complaining of painful and frequent urination. Six months before he had undergone an operation for right inguinal hernia. At this operation the bladder was injured and closed with sutures. He does not know what form of suture material was used. Since then he has had vesical irritability which has gradually increased, so that now the patient has to void 4 or 5 times at night.

Cystoscopic examination shows a small irregular calculus

suspended from the right anterior wall of the bladder at a point apparently 4 cm. back of the prostatic orifice. No other stone was seen.

With the rongeur cystoscope the calculus was easily grappled and removed, but the suture to which it was attached did not come away. Owing to hemorrhage no further operation was done.

On April 20th the second operation was done and the rest of the calculus and the silk ligature, about 1 cm. long, were removed with the rongeur cystoscope. On April 27th a third cystoscopy was performed and a very small calculus was found hanging from the bladder wall by a thread. With the rongeur the calculus and thread, 1.5 cm. long were easily removed together.

On May 6th the fourth cystoscopy showed another ligature with another calculus attached to it, when it was easily removed with the rongeur cystoscope. On May 8th cystoscopic examination showed no more calculi or ligatures remaining. May 29th. Patient says that he feels entirely well. Cystoscopic examination shows no more sutures in the bladder and no calculus. Patient discharged.

Remark: Experience in this case showed that the intravesical rongeur can be used with great precision in picking up foreign bodies such as calculi and sutures.

CASE 6, No. 1814. F. A. B., aged 73.

Patient had ungone operation for prostatic hypertrophy on June 11, '08. Five months later he returned complaining of considerable irritation in the neck of the bladder, frequency of urination.

The cystoscope showed vesical calculi and large irregular granulations all around the prostatic orifice. The stones were crushed and evacuated with some improvement, but on Jan. 7, '09, patient returned complaining of considerable irritation and burning in the region of the vesical neck. There was no stone present but the cystoscope showed large irregular unhealthy looking granulations about the prostatic orifice. With the rongeur

cystoscope these were removed at several sittings. The specimens varied in size from 8 to 1.5 mm.

On April 27th the patient returned and the cystoscope showed that the prostatic margin was much more normal in appearance and covered by quite smooth mucous membrane. One or two small lobules, probably adenomatous hypertrophies, were seen. With the rongeur cystoscope an attempt was made to remove these with partial success. On May 18th patient returned saying that he was greatly improved. He still complains of burning in the posterior urethra. With the urethroscope considerable enlargement, irregularity and congestion of the verumontanum was seen. It was thoroughly curetted and touched with nitrate of silver.

June 5th. Patient returns saying that he is greatly improved but some burning in the posterior urethra is still present.

CASE 7. No. 1907. W. E. S., aged 74. Admitted May 22, '98.

Patient had elsewhere been subjected to perineal prostatectomy and then a suprapubic prostatectomy. Fistulæ were still present in both places. The cystoscope showed that the prostate had not been completely removed by either operation, rounded lobes, which presented intraurethrally, being present on both sides.

On May 23, '08, the old suprapubic scar was excised and with the finger in the rectum for assistance an attempt was made to enucleate the remaining intraurethrally projecting prostatic lobules with apparent success. The perineal fistula was then excised and closed with sutures. The perineal wound healed per primam, but the suprapublic wound persisted, and on Dec. 1, '08, the cystoscope showed that the prostatic lobules had not been completely removed, there being present a small globular mass on the left side which presented at the vesical orifice. On Jan. 16, '09, the rongeur cystoscope was used and several small masses of prostatic tissue were removed.

February 16th. The cystoscope shows that one lobule had been removed, but that there still remains one small lobule on

the left side. With the assistance of a finger in the rectum and the rongeur, brought so that the blades were almost entirely out in the urethra, the mass of prostatic tissue 1.5x2x3 cm. in size was easily removed and drawn out through the urethra. Following this the patient was able to void urine more easily, but the suprapubic scar had to be excised before it would heal.

May 21, '09. Patient reports that he is able to retain urine for six hours and feels entirely well.

CASE 8. No. 2073. A. S., aged 51. Admitted Jan. 9, '09, complaining of frequency and difficulty of urination.

Examination showed that the prostate was slightly broader than normal, but did not bulge towards the rectum.

The cystoscope showed a small rounded median lobe about the size of a cherry with a fairly deep sulcus on each side. The lateral lobes were not intravesically enlarged. There was 25cc. residual urine present. The bladder was hypertrophied and contracted, holding only 110 cc. Immediately after cystoscopy the rongeur cystoscope was introduced and no difficulty was experienced in grasping the median lobe and excising it in one bite. The specimen removed was 2 cm. long and 1 cm. in diameter and was partly covered with mucous membrane. The operation caused the patient very little pain, and there was only slight hemorrhage. The patient voided urine freely immediately afterwards and noticed considerable improvement. Eight days later the patient reported that he felt entirely well, voided freely in a large stream and already experienced great relief.

Cystoscopic examination showed complete absence of the median lobe, the prostatic orifice being quite normal in this region.

In conclusion I may say that my results from radical excision of the surrounding vesical wall in cases of malignant tumor of the bladder have been very successful. I have four cases that have not shown any evidence of recurrence, three, three, two, and one years after the operation.

In benign cases of papilloma I have had some cases in which

the tumor has not recurred, but there have been others, in which a careful and apparently radical procedure was carried out, in which recurrences have come, not in the site from which the tumor was removed, but elsewhere, generally on the opposite side first and then on the anterior wall.

It seems probable that injuries produced at operation are the exciting causes of these recurrences, and it seems almost impossible to prevent them.

The instruments which I have demonstrated are offered, not to replace the suprapubic operation, for I am not yet convinced that Casper is right in thinking that it should be abandoned, but as an assistance in diagnosis, and possibly of great value in treatment in some cases. If benign tumors can be successfully removed with the "intravesical rongeur," and the bases of the tumors either cauterized, or treated with 10 to 20% resorcin, and if they do not recur, as claimed by Nitze, we shall have, I believe, an instrument of great value. That it can be used with precision to remove sutures, calculi, various other foreign bodies, and even pedunculated prostatic outgrowths adds to its value.

DISCUSSION

Dr. A. T. Cabot of Boston. There are a great many points to discuss with reference to this question of operation on malignant growths. I may be wrong but I have the conviction that the bad statistics that Dr. Young speaks of, the frequency of recurrence in scars, etc., were obtained before the realization of this sort of recurrence, and that adequate measures were generally not taken in these cases to prevent the implantation of tumor tissue in the wound of entrance. I looked over Nitze's earlier statistics with a good deal of care. I have not got hold of the report of eighty cases, but I carefully examined his early paper, and in looking it over I did not find a single case where the cystoscopy upon which he based his opinion of nonrecurrence of the tumor was more than a year and a half after the operation. I hope Dr. Young can tell us more particularly about the duration of time which had existed after the operation in this series of eighty cases which Nitze has reported. In that series that I saw there was one case which has been commented upon, as showing the ad-

vantage of intra-vesical against the open operation. In that case the suprapubic operation was done, and the patient remained well for *three* years. At the end of that time he was found to have a recurrence. He was operated upon by the intra-vesical method of Dr. Nitze, and at the end of *one* year the cystoscope showed no recurrence. That was claimed as a triumph for intra-vesical as against extra-vesical operation. Sufficient time had not elapsed to know positively about the permanence of cure in those intra-vesical cases treated with the operating cystoscope.

This choice of operation is an important matter. I perhaps look upon the matter too much from the standpoint of a general surgeon. I know that if I had a wart such as I know sometimes degenerates into carcinoma I should greatly prefer that one of my colleagues should cut it out with a margin of healthy skin and get good healing rather than that he should cauterize with the uncertain cauterization such as you get in an intra-vesical operation. My own feeling up to now—and I am entirely ready to receive a contrary conviction—is that by making a large opening in the bladder, by protecting the tissues as far as possible with sponges, by very thorough washing out afterwards, to remove any possible bits of tumor tissue or cells, you get a better and surer removal of an intra-vesical benign tumor than you do by cutting or cauterizing it with an instrument in the bladder. Within the past three weeks I have had the opportunity of examining a patient upon whom I operated suprapubically for papilloma three or four years ago. The site of the operation was perfectly smooth, showing no sign of recurrence whatever. That was only one case. I have had but few cases, and I should be glad to know what the statistics really do show. I do not think the cystoscopies made within a year of the time of removal amount to much.

Dr. Francis S. Watson of Boston. The following things with regard to tumors of the bladder we can put down as being definitely known: That the majority of them are malignant; that even with those that are beingn the proportion of recurrences, after they have been removed, is remarkably large; that there is no other means of determining their nature except by a careful examination of *all parts* of the growth, microscopically.

Now if these three things are true, and they are undisputed so far as I am aware, it seems to me that they make irrational, except as a palliative measure, the operations for their removal, by the so called intra-vesical methods, that is to say, by means of instruments passed through the urethra. The statements made above lead, as I see it, to but one logical conclusion, which is that there are but two courses open to us when considering the

question of the treatment of vesical tumors, the first being to make no attempt to *cure,* but instead to apply such palliative measures to the disease as experience has shown us to be beneficial in checking hemorrhages, in delaying the advent of cystitis of a foul character, and in alleviating pain; the second being to seek *cure,* and in the latter event to adopt what seems to me best in view of the conditions presented by these cases among which the three stated above are perhaps the most important and to treat at the outset all cases believed to be malignant in character, as we treat malignant disease elsewhere in the body when we operate radically upon it—namely, to remove the whole of the infected tissues, or unless we have a reasonable prospect of being able to do this not to attempt to operate radically at all, but merely to palliate—and in the case of growths, believed at the time of a first operation to be beingn, if they recur, to treat them also in the same radical way that the malignant ones should be treated, namely, in that just stated above.

This seems to me to be the only logical plan of action, and it is what led me to put forward in 1905 (December *Annals of Surgery,* 1905) at the May meeting of this Association, in Montreal of that year, the proposition with which you are all familiar and which I will consequently not repeat now, otherwise than to say that I refer to my proposal to *remove the entire bladder* under the conditions I have mentioned a moment ago, and to precede this operation by a *preliminary* one which has for its object the diverting of the urinary secretion, by performing a bilateral simultaneous nephrostomy and tying off both ureters; finally to rest content in inoperable cases, (inoperable in the sense of attempting to cure) with this short circuiting of the urinary secretion by the bilateral nephrostomy as a palliative step, not disturbing the vesical conditions directly at all.

I cannot agree with Dr. Hugh Cabot in regarding nephrostomy as a formidable operation; it is attended by but relatively little shock, and the absence of shock has been especially noted by the operators who have done the simultaneous bilateral nephrostomy. It is not a long operation, except in cases in which unusual difficulties are presented, and they will be very rarely met with in connection with vesical tumors; the operation should not require over 10 or 15 minutes to reach kidney, and in thin subjects it may be completed in a good deal shorter time often.

A patient can be made very comfortable after nephrostomy, if the drainage is suitably arranged. I have been very well satisfied with the contrivance I have devised for the purpose, with which you are also familiar and which therefore, I need not describe.

The only desirable form of ureterostomy is that which carries the ureter to the skin; the objections to ureterostomy are: the liability of the ureter to kink, the less free drainage that it affords, the liability of infection of the kidneys, the impossibility of exploring the interior of the kidney at the time of operation and of curing any renal conditions, and the chance of the closure of the ureter at some point between the renal pelvis and the skin; whereas in the case of nephrostomy you have got a good big open wound with a good tube in it, through which you can irrigate it freely. Finally the kidney does not suffer from such procedures.

I do not see quite how we can get around this thing. We dodge the issue if we do not apply to all these tumors the same principle as in the case of tumors elsewhere in the body. The great majority of them are malignant, and you cannot tell whether they are malignant or not before you take them out and examine all parts of them. We should either do a palliative operation for the relief of the pain, or operate when we have a reasonable hope of taking the whole disease away, which means taking the whole bladder out, and in the way I have described, namely as a secondary operation after having disposed of the step of diverting the urinary secretion by a double nephrostomy.

Dr. L. Bolton Bangs of New York. One important fact in regard to Dr. Hugh Cabot's case he did not state, and that is what became of the patient. I say that with great tenderness of feeling for the reporter, because there is so much about this question of cancer that is, at present at least, hopeless that I have been led to take a very conservative position. and I have been taking that position because of one fact in regard to which I have not been able to get any information. We do not yet know what an undisturbed tumor, which at first may seem benign and subsequently take on the features of malignancy, will do when left to nature's own course. There are cases, apparently malignant, which pursue a benign course for many years. I believe there are men in this gathering now who have cases that from clinical conditions finally became malignant, and yet the individuals have lived on comfortably by palliative treatment for several years. I have had them.

Dr. Francis R. Hagner of Washington, D. C. I had a patient, a man, with a diverticulum behind the ureter on the left wall of the bladder. I put my finger into it to see if there was any stone in it. I found it very movable. I turned it wrong side out, put my finger into the rectum to see that I had not pulled it along with the diverticulum, made

an incision through the mucous membrane on each side of the diverticulum, and then put in mattress sutures. Of course, that would not be applicable to every case.

Dr. Louis E. Schmidt of Chicago. If one believes the statistics of Nitze one is not in a position at the present time to state positively that the suprapubic operation for so-called benign tumors is absolutely the best mode of treatment. If we believe statistics at all, we are in a position to believe Nitze. I think Dr. Young has done a world of good in bringing out a new operating cystoscope. I have had experience with the instruments of Nitze, Casper and Kolischer and all three have their advantages and disadvantages. There can be no question at all that when we have an instrument that will readily permit of the removal of the so-called benign tumors, particularly in those kind of cases which Nitze cites himself, the removal being followed by cauterization, that is the operation of choice according to Nitze's statistics.

As to the absolute necessity of operating on malignant tumors by one method or the other, I have had occasion to look up statistics of late, and the European statistics are inclined to recommend the leaving alone of all tumors that involve the base of the bladder. Even with the operations such as Harrington's and Watson's, where there is complete removal of the entire bladder including the tumor, I am inclined to believe that the results will be exactly the same in those cases as in Wertheim's operation for removal of the uterus with the adnexa and glands. It is almost an impossibility in advanced cases of tumor of the bladder to remove all of the iliac glands, particularly those which are almost infinitesimal in size and practically cannot be seen during the course of the operation and hence are overlooked.

Dr. F. Tilden Brown of New York. While in no way optimistic about operative procedures for growths of the bladder, I think it is a mistake to have it go on record that these growths should be ignored. It seems to me that their removal, even if they are benign growths in many cases, answers the purpose of removing the present symptoms. These recurrences in most instances have been on sites that were not that of the former removal, and it is not unlike the allusion made by Dr. Cabot about a wart. Its removal is desirable, not because of the likelihood of the recurrence of warts, but on account of the tendency of the tissues in that region to take on recurrences of the growth. So that I think, in view of the tendency to recur, and the longer convalescence and restraining con-

dition of the patient incidental to epicystotomy, that this introduction by Dr. Young of a decidedly improved instrument for their removal is a good thing. It seems to me it fills a place.

I would like to ask Dr. Young whether in his dealing with the growth in the diverticulum he took any note of the inflowing urine during the operation. Apparently not, and in that particular case there would have been no particular reason to sidetrack the urine coming from the kidneys, as they were apparently not involved, but in cases where there is a marked cystitis or the kidneys are involved, I should think that in throwing open a trap door into the pelvic peritoneum some account must be taken of the soiling during the operation. Even by packing the bladder with gauze the gauze would become saturated enough to permit soiling by pressure on these pads.

I could not hear all that Dr. Watson said in reference to dealing with tumors of the bladder. He made some allusion to an experience of mine which was similar to that had by Dr. Cabot in his reported case of where a great deal of time was taken up with making sure that he had reached the pelvis of the kidney. Now, of course, in diseased conditions of the kidney where we have a hydro- or pyonephrosis there is nothing simpler than getting into the pelvis, but taking a normal kidney and trying to go with any instrument from the cortex down into the pelvis and have it come out in the pelvis of the kidney is a very dextrous thing, and doubly dextrous when one is in an uncertain position with reference to the kidney. Experiencing that in my first case, in the second case, instead of dilating the pelvis with water, I made a small slit in the ureter about an inch and a half below the pelvis, and passed through it a curved, small pointed forceps, and it was easy with that to feel that it went into a calyx in the middle of the kidney, and when there it was pushed through very readily and brought out at the convex border. Then, with that in place and stretching the opening somewhat, it was very easy to grasp the catheter with which the drainage was to be done and draw it back into the pelvis. I think that it is a fault to use large tubes there, and particularly faulty not to use a tube which is as smooth and long as the best catheter, because it is going into a normal pelvis and the roughened edges would be apt to excite some reaction of the mucosa.

Dr. N. B. Carson of St. Louis. I have been unfortunate enough to remove the entire bladder in one case, and as the case presents some features of interest, I will briefly report it.

Many years ago in my early days of practice I assisted in the re-

moval of a stone from the bladder of this patient. Later the patient came to me at the hospital presenting very urgent symptoms of bladder trouble, discharging very fetid and large amounts of urine, with numbers of large pieces, which upon examination proved to be malignant. Operation was advised, to which the patient finally consented. A suprapubic cystotomy was done, and upon opening the bladder we found a large papillomatous growth springing from the inner and upper margin of the left ureter. I think the base of this tumor was about an inch in diameter. We removed this and drained the bladder, but in a short time we were convinced that we did not make a thorough removal of the growth. The patient then consented to a radical operation, and I concluded to do an extirpation of the entire bladder. The question then arose as to the best manner of disposing of the ureters. After a careful consideration of the subject and consulting statistics, I concluded that the best way of disposing of them and the safest would be to transplant them into the rectum. This was done. In the first place, I would say that the removal of the bladder presented not many difficulties. It was removed without much trouble and with a little loss of blood. We implanted the ureters into the rectum, but whether from faulty technique or because of the unmanageableness of the patient, I cannot say, they did not stay there, and only for a day or two did we have discharge of urine from the rectum. However, I will say that he was able to retain a considerable quantity of urine in the rectum—some several ounces—while the ureters remained in this position. They evidently retracted into the cavity from which the bladder had been removed. He lived about eight months after the operation, and died from infection of the kidneys, without any return of the disease. We found at the post mortem an artificial bladder which would hold about four ounces of urine. He was able to retain his urine for some time and discharge it with considerable force. The patient passed the remainder of his life after the removal of the bladder in comparative comfort, after recovery from operation.

DR. A. T. CABOT of Boston. I would like to ask Dr. Carson whether that was an extra-peritoneal operation?

DR. CARSON. Yes.

DR. CABOT in closing. In reply to Dr. Bangs, I will refer him to the Presiding Officer, whose wise curtailment of my time made it impossible for me to say that the patient went home and died a short time afterwards. The case is not reported because of its brilliant operative success.

In regard to what Dr. Watson said as to the rapidity of the operation, I fear that it will never be possible for me to do the operation in that length of time, at least, in such a patient as that. On the other hand, I

do not believe that the technical difficulty should lead us to banish it as an operation. If it is a proper method, the technical difficulties can certainly be overcome. What Dr. Watson said in regard to the shock of this operation is borne out by the cases I have seen. In these there was not much shock. This is particularly true of removal of the bladder, which was not accompanied by shock.

I am sorry to hear Dr. Schmidt advise ignoring these growths. I daresay it is my youthful enthusiasm which leads me to desire to do something for these people, but I cannot help thinking there is a type of case in which the disease cannot be removed locally without removing the bladder, and yet in which the total removal will result in cure. The case reported by Dr. Carson seems to me to bear this out in many respects. I think the technique in that case was faulty and that if the operation had been done in two stages it would have been successful.

Dr. Schmidt. I do not want to be misunderstood in saying that I do not advise it. Compare this operation of removal of the bladder with the operation for removal of the uterus and the glands, and the reason I do that is this. Wertheim's operation has been done over a thousand times, if not a great deal oftener. His personal records show over 300 cases. The removal of the bladder has been done not over 50 times. Now, of course, we are recording results from few cases and many operations. Wertheim's cases have shown an enormous number of recurrences. Why? Because they have not been able to remove the *metastases*. It is easy enough to remove the bladder. Any novice can do that if he cares to. But to get out the glands and remove all the tissue that is involved is an entirely different question, and I think it is an operation that should not be recommended too quickly or too highly simply from the few recorded cases that we have at the present time.

Dr. Young in closing. I want to take very much the same position as Dr. Schmidt in regard to this total extirpation of the bladder. I have performed the operation in one case; a man who was suffering terrible pain in the bladder from an extensive carcinoma which was not relieved by suprapubic drainage, I therefore did a double nephrostomy, ligated the ureters, but, much to my surprise, he suffered great pain from the bladder spasmodically contracted upon the tumor. On that account the abdomen was opened, extensive metastases were discovered, and the entire bladder, with the exception of the part adjacent to the prostate, was removed. The patient made a good recovery and was greatly relieved. He lived for several months in much greater comfort than he was in before.

I really think it is foolish to think of curing a patient where the disease has gone so far as to necessitate extirpating the whole bladder. It

seems to me that with a localized carcinoma in the bladder it is not necessary to remove the whole viscus, and if it has gone so far that it is necessary to do so, I believe it has gone too far to be curable. Cystectomy is justifiable, in my humble opinion, only to relieve pain, as in the case detailed above. Recently I had an opportunity to operate on an old man with a cancer in the base of his bladder involving the left ureter. The tumor was quite large, and I felt absolutely certain that it involved the lymphatics behind the bladder. His principal trouble was that when clots would form he would have difficulty in voiding them. The cystoscope showed a small benign median prostatic bar and I decided to perform a Bottini operation to enlarge the vesical orifice, and facilitate the passage of the clots. The bladder tumor, although malignant, is giving him practically no pain at all. I do not think, however, that cases in which carcinoma is present in the bladder and is at all localized are hopeless. I have had two cases, one who lived two or three years and died of something else, and another case that is still very well, after about two years, without any hemorrhage or any other evidence of recurrence. I think if the operation is done radically, with great care not to come near the tumor, that it ought to be successful, particularly if not in the region of the base, because there recurrences take place much earlier.

I am inclined to think that Dr. Cabot is not exactly correct in saying that if a wide exposure of the bladder is made and great care is taken not to touch the tumor, it is possible to get a good result in nearly all of the vesical papillomata. As a matter of fact, the recurrences occur in new sites. I have thought that possibly they occurred at places where vesical retractors produced pressure lesions. In some of my cases they recurred in the site of the suprapubic scar, although great care was taken not to break off any of the villi. A case which had been operated on by a French surgeon came to me six months later, and I found fourteen tumors in various parts of the bladder. I removed each of them with an area of mucous membrane, not touching a tumor, and in three months she had five others, but not in the site of the excisions at all.

The results from the suprapubic treatment have not been satisfactory in my hands, and I am casting around to see if it possible by simpler means to treat and keep them comfortable, if not to cure them.

As remarked by Dr. Cabot, Nitze's statistics are unsatisfactory in that he does not go into details in the later reports. I saw one patient three years after Dr. Nitze had removed a tumor from the left half of the bladder with his snare and the cystoscope showed no recurrence. I took his prostate out and there was not a sign of vesical tumor present, and he is still well two years later.

Second Day, June 1, 1909

OBSTRUCTIVE CALCULOUS ANURIA

By F. S. WATSON, M. D., of Boston.

IN a recent number of the *American Journal of Physiology*, a physiologist makes the statement that "Critical examination of the literature shows no conclusive evidence as to how the kidney produces urine from the blood." The clinician may appropriately supplement this confession of defective knowledge by adding that study of anuria fails to supply conclusive explanation as to the manner in which suppression of the urinary secretion is brought about.

It is not unprofitable to summarize the factors of both physiological and pathological problems with regard to which there is general agreement and which may be regarded as established. Under this heading we may place the following physiological ones:

1. A living membrane composed of the walls of the glomeruli and parts of the urinary tubules intervenes between the blood and the urine. The urine is formed by the passage through this intervening wall, of water and molecules of certain substances held in solution in the blood.

2. It is highly probable that some, at any rate, of these molecules are chemically changed by the secretory activity of the epithelial cells of parts of the convoluted tubules and of the ascending arms of the loops of Hënle.

3. The channels by which the urine escapes from the kidney

must be free and unobstructed in order to have the urinary secretion normally produced.

4. The formation of the urinary secretion is influenced by the pressure, rate of circulation, molecular concentration, volume, and viscosity of the blood in the kidney.

When we go beyond these fundamental data and undertake the study of the more remote elements by which each of the above named factors is influenced and endeavor to interpret them, we enter a field of fascinating, but largely speculative nature. Of the obstructive or excretory form of anuria, which is that one with which this communication is concerned, the following things may be stated:

1. When the ureter is suddenly closed, as it is in cases of calculous anuria, the urinary secretion is very quickly arrested, a small amount only being formed and accumulated above the point of impaction of the calculus.

2. The kidney is enlarged owing to congestion and œdema of the organ which follow upon the closure of the ureter and increased intra-renal pressure thereby produced, and not because of being distended by accumulation of urine within it. The congestion and œdema continue for variable lengths of time and then subside.

3. Progressive destructive changes begin in the secretory elements of the kidney soon after the establishment of the anuria and, unless the obstacle be removed, continue, ultimately destroying the entire renal substance by a gradual and aseptic process of atrophy, if the kidney is not infected, more rapidly, by suppuration, if it is infected.

4. In the majority of cases of unilateral calculous anuria the unobstructed kidney is either congenitally absent, extensively diseased, or wholly destroyed. In a minority of the cases, the unobstructed kidney is but moderately damaged, and in a few, some observers believe it to be normal. In the latter instances, the suppression of the urinary function of the unobstructed kidney is explained by assuming it to have been produced by the influence of the so-called reno-renal reflex inhibition originating in the condi-

tions produced by the obstruction of its fellow organ of the other side.

The points connected with obstructive calculous anuria, of which I wish to speak are the following:

1. The reno-renal reflex inhibition of the unobstructed kidney.

2. Some of the difficulties of diagnosis.

3. Certain features of treatment, viz.; the value of the ureteral catheter and injection through it of boric solution, or oil as a therapeutic measure. The value of sub-cutaneous saccharine solutions in reestablishing the urinary secretion. The same with regard to the transfusion of normal saline solution. The question as to what, if any, circumstances make the direct removal of the obstruction from the ureter as a primary measure preferable to nephrotomy. The kidney which should be first be operated upon in cases in which the location of the calculus is not definitely known. The desirability of performing simultaneous bilateral nephrotomy or nephro-lithotomy in some cases, and which these cases are.

1. *The reno-renal reflex inhibition.* No one denies that in the majority of cases of unilateral calculous anuria, the opposite or unobstructed kidney, is, as has been said, either absent, extensively damaged, or wholly destroyed. There are some who assert that these conditions are invariably present on the unobstructed side. The contrary belief is held by other observers and I am in accord with them.

The evidence offered in support of the former of these contentions is that no case of unilateral calculous anuria has been reported in which a histological post-mortem examination of the unobstructed kidney has shown it to be structurally normal, or but slightly involved in pathological changes.

The evidence furnished by those who maintain the contrary view is that of a number of clinical observations in which normal urine has been drawn by ureteral catheter from the unobstructed kidney after the cessation of the anuria; and again that of having normal urine passed by the remaining kidney after a nephrectomy,

PLATE X.—Presented by Dr. Francis S. Watson.

when anuria, which followed the operation, ceased, as in three cases reported by Rovsing in which he left in each instance a clamp upon the pedicle of the kidney he removed, and in all of which anuria followed the operation and lasted two or three days. Upon the removal of the clamp from the pedicle, the kidney that remained on the other side at once resumed its urinary function, secreting in each instance, as has been said, normal urine. Another confirmation of the occurrence of reno-renal reflex inhibition of the normal and unobstructed kidney is furnished by the work of Götzl, who in three out of 12 experiments with dogs, produced suppression of urine of one normal kidney clamping the ureter of the other one. In one instance he produced an alternating suppression and re-establishment of the urinary secretion in correspondence with the clamping and unclamping of the ureter. Those who maintain the belief in the occurrence of the reno-renal reflex inhibition produced by sudden obstruction of the opposite ureter, assume that if the unobstructed organ secretes normal urine after anuria ceases, as in the cases cited, the kidney secreting it is structurally normal, or at most involved in but temporary and unimportant pathological processes; and this inference would seem to be justified until it has been demonstrated that a kidney which is extensively diseased is capable of producing perfectly normal urine, which, so far as I am aware, has not as yet been done.

The point to which I wish to call attention is that the *exact nature* of the inhibitory influence that produces the suppression of the secretion of an unobstructed kidney in cases of calculous anuria, is of less importance to the surgeon at the present time, and of less benefit to the patient than it is to recognize, what I believe to be the fact, namely that there are a good many more cases than is generally appreciated in which the suppression of the secretion of the unobstructed kidney takes place when that organ has a most important amount of still capable substance left in it, and that whatever be the exact nature of the inhibition, it is at any rate, of such kind that the laying open of such a kidney, may make the difference between the patient's living or dying.

Before leaving this part of the subject there are three cases to which I will refer, that are suggestive and interesting and are appropriate to the discussion of the reno-renal reflex. For the opportunity to report the first of these I am indebted to the courtesy of Dr. Hugh Cabot.

In this case anuria was not present at the time at which a nephrolithotomy was done upon one of the kidneys. The kidney was drained, it secreted abundantly and the patient did perfectly well for the next four days. Both kidneys then suddenly ceased to secrete. Dr. Cabot promptly operated upon the other kidney and removed a calculus which was obstructing the outflow of urine from it. Both kidneys at once resumed their urinary function. The wounds healed in due course and the patient was in good condition at the end of six months during which he was under observation. In this case both kidneys were considerably damaged. Neither one was functionally useless. It is possible that neither one alone would have been capable of maintaining the life of the individual very long.

CASE 2. The second case is one reported by Albarran in which nephrectomy was done upon one of the kidneys and the organ was drained. Amuria was not present at the time of this operation. The kidney was stated to be merely enlarged and congested, a calculous was not present in it nor in its ureter. The kidney secreted abundantly through the drainage tube for twenty-three days at the end of which anuria occurred and was coincident with the blocking of the ureter of the other kidney by a calculus. No operation was done. The patient died.

CASE 3. The third case was published a good many years ago by Ransohoff. Anuria was not present at the time at which a unilateral nephro-lithotomy was performed. The kidney operated upon was pyonephrotic, but, as it appeared subsequently, was capable of performing a useful degree of functional work, in fact, it did two-thirds of the total functional work. The kidney was drained. All went well for one month. Anuria then occurred. On the third day thereafter the other kidney was laid open. It was distended by a large collection of pus which had

accumulated owing to an obstruction of the ureter, the nature of which was not learned. This kidney was also drained and permanent fistulæ were established in both loins. Immediately after the second operation the urinary function was resumed, and continued uninterruptedly for the next three years during which the patient was under observation and remained in good health.

In the first two of these cases the inhibitory influence upon the kidney first operated upon appears to have been in the nature of a reno-renal reflex. In the third one, the suggestion is conveyed that the inhibition may have been due to nephrotoxins generated in and absorbed from the second kidney operated upon, and conveyed to the opposite one by the blood current. The other points of interest in these cases are the facts of the inhibition affecting a kidney while it was draining through the loin and therefore indubitably free from obstruction, and, that although both kidneys in both cases were extensively diseased, yet both were functionally capable in a useful degree and it is very probably that the united work of both was essential to the maintenance of life. The bearing of these facts upon the surgical treatment seems to me to be of importance, and will be referred to later.

Difficulties in Diagnosis. These occur when neither X-ray nor ureteral catheter examination is available, and when the history and physical examination fail to give any clear evidence as to the presence of calculi, as may happen in a few atypical cases, or when there are calculi on both sides and one of them is giving rise to no symptoms and is thus likely to be overlooked.

When the two diagnostic methods mentioned above are available, we are not always led by them to correct conclusions. Thus the radiographic pictures may present appearances that can readily lead to a mistaken interpretation, such, for example as the shadows that are made by "end on arteries," phleboliths, calcified glands, fecal concretions in the intestine or appendix; and again there may be failure to demonstrate a small uric acid calculus in a stout patient, or one whose bowels have not been carefully cleared before the examination.

The ureteral catheter may be arrested by a valve or fold of the inner lining of the ureter and its tip fail to pass as far as the calculus or the calculus may be covered by pus, mucus, or blood and fail to be felt by the examiner or to record any mark on the wax tip of a ureteral sound, when that instrument is employed.

Treatment. The points connected with the treatment of calculous anuria upon which there is a general agreement, and which I will merely enumerate are as follows:

1. The mortality attending expectant treatment is about 80%, that of the operative treament is about 40%.

2. The nearer the beginning of the anuria operative treatment is applied, the less is the mortality attending the intervention.

3. The treatment of calculous anuria should be surgical. This does not mean, however, that palliative means of treatment are not to be employed if the restrictions specified in the next clause are observed.

4. Surgical treatment should not be delayed at all in the presence of urgent symptoms, if uremic manifestations exist, if it is believed that both ureters are blocked by calculi, or if it is known that the calculus is too large to be passed spontaneously. Delay should not exceed forty-eight hours in any case and in most instances it should not be so long as this.

5. The surest and quickest manner of restoring the suppressed urinary secretion, is by free nephrotomy incision of the kidney and draining it for some days. The calculus should be removed if the patient's condition is not too critical to permit of its being done.

6. The nephrotomy incision should not be entirely closed at the time of the operation.

7. The kidney believed to be the least damaged of the two should be operated upon first.

8. An apparently good condition of the patient and the abscence of uremic manifestations does not excuse delay in applying surgical treatment.

9. A long period of anuria and the presence of uremic mani-

festations are not contra-indications to operation and recovery may follow in a few cases of this sort.

The Therapeutic Value of the Ureteral Catheter. There have been 11 cases reported in which the passage of the ureteral catheter into one or both ureters has restored the suppressed urinary secretion. The surgeons reporting these cases are: Imbert, Kreps, Rovsing, Casper, Hock, Ertzbischoff, Löwenhardt.

Casper and Hock each employed in addition, an injection of watery solution into the renal pelvis through the catheter. In Casper's case the urine did not flow until this was done, seven minutes having elapsed before it was made. In Hock's case it was done at once and the urine flowed at once. There is nothing to show that the eye or lumen of the catheter may not have been clogged in Casper's case and that the success of the injection may not have been due to its having removed the obstruction. It is noted that the injection in this instance caused sharp pain. With the exception of Ertzbischoff's case, in which the catheter remained in place 24 hours before the urinary flow occurred through it, the simple passage of the instrument in the remainder of the cases at once restored the secretion and it is therefore not clear that the injection into the renal pelvis advised by Casper has an advantage over the use of the catheter without the injection.

In Löwenhardt's case, an injection of oil through the catheter into the ureter above the calculus was followed by its spontaneous expulsion. This step would seem to be worthy of further trial.

It does not seem to me that the ureteral catheter should, even when successful, be regarded as other than a temporary expedient for the purpose of securing better conditions under which to operate for the removal of the obstruction in the ureter than those which exist during the anuria, for it is not apparent on what grounds the leaving of a calculus impacted in the ureter and which has already once produced anuria, can be defended.

The Employment of Physiological Saline and of Saccharine Solutions. I have never succeeded in restoring the suppressed secretion of urine by the use of normal saline solution. I have not

employed venesection in connection with it, but from the evidence of others, it would seem to add to the efficacy of the injections and to be well worth trying.

Archard and Jeanbrau recommend the employment of 25.0% solution of sugar for the purpose of restoring the suppressed renal secretion. Jeanbrau reports two case of calculous anuria in which he injected 500 c.c. and 400 c.c. of this solution respectively. Anuria had been present for 56 hours in the first case and for three days in the second one.

The urinary flow was re-established at the end of an hour and a half after the injection in one case, and after an hour in the other. Both patients recovered without further treatment and remained in good condition for a long time during which they were under observation; in one case for five years.

Bilateral simultaneous nephrotomy. I think we may accept the following statements as being true in cases of calculous anuria:

1. Patients with this condition stand in urgent need of having restored to activity all the functionally capable renal substance they possess.

2. The surest way to accomplish this is by a free nephrotomy incision and draining the kidney.

3. Surgical intervention which stops short of freeing all the capable renal substance, fails to give the patient his best chance of life.

4. Whenever a unilateral operation is done in a case in which the kidney not operated upon contains a useful amount of functionally capable substance, the surgeon, in not operating upon that kidney fails to give the patient his best chance of life.

5. The greater the destruction found in the first kidney laid open, the greater the probability that the second one will contain a useful amount of still capable substance.

It is doubtless true that the number of cases in which the unobstructed kidney or both kidneys contain a useful amount of capable substance is relatively small, but this is not a reason for neglecting to take advantage of the circumstance when such is the case, and moreover I think the number of which it is true is

larger than is usually believed. In a series of 189 cases of calculous anuria which I collected, 133 were unilateral and 56 bilateral. Of the former number there were 17 in which the unobstructed kidney contained a useful amount of capable substance; of the 56 bilateral cases there were 22 in which both kidneys presented this condition. In 15 of the 22, unilateral operations were done and all the patients died; in the remaining seven, simultaneous bilateral operations were done and four of the patients lived. The seven operators were Lange, Turner, MacMunn, Moschkowitz, Watson, Babcock, Rovsing.

I cannot say how many, if any, of the fifteen patients who died after the unilateral operation, would have recovered, had the simultaneous bilateral one been substituted for it, but it is certain that none of them received the benefit of having had set at liberty *all* the capable renal substance that they possessed, for, as I said, there was capable substance in both kidneys in all of the 15 cases.

The condition found in the first kidney operated upon should be, I think, the chief guide in determining whether the second one should or should not be laid open immediately. In the unilateral cases, the finding in the first organ examined, too little substance to make it seem at all probable that the patient's life could have been sustained by its functional capability alone prior to the occurrence of the anuria, makes it fairly likely that the other kidney has a useful degree of functional capability left in it, and it should at once be operated on. In the bilateral cases, the indication is clearer for doing the double operation than in the unilateral ones, and here it should be done always unless there is obviously sufficient good substance in the first organ to make it highly probable that it can support life by its sole functional work.

I would go further than this and say that the simultaneous bilateral operation should be done in all cases in which there are calculi on both sides, even if but one ureter is at the moment blocked, the calculus of the opposite side being in the kidney merely; and—if I may leave the strict text of this communication for a moment—I would add also that I can see no valid reason

for failing to remove the calculi from both sides, even when there is no anuria present, for we have seen the danger that may arise from the presence of a stone in the unoperated kidney strikingly illustrated in the cases quoted of Hugh Cabot and of Albarran. Moreover we are certain that in leaving a calculus in the kidney even if it does not slip into the ureter and cause anuria, as we have seen from those cases that it may do, its presence in the kidney is continuously working injury upon an organ that is already more or less injured by the fact that it has been harbouring a calculus, and which consequently can ill afford to continue to do so any longer. For which reasons, it appears to me to be the part of common sense to remove calculi from both kidneys at one and the same time, whether they have already got into the ureters and caused anuria or not.

The objection that is likely to be opposed to taking this course in these conditions is that shock will thereby be too greatly augmented. This, however, is not, I think, the fact. Everyone of the operators to whom I have referred as having done the bilateral simultaneous operation has made special note of the fact that shock was not an important feature in these operations. It requires longer to operate upon the two kidneys than upon one of them, of course, but under ordinary conditions the double operation should not take more than fifteen minutes or so, and that length of time need not militate against adopting this procedure, in view of the advantages that may be gained from its employment, and of the dangers and disadvantages of stopping the intervention with a unilateral procedure only.

The reasons for preferring nephrotomy or nephrolithotomy to urettero-lithotomy as the first step to be taken in the surgical attack in the cases of calculous anuria.

If we have learned by radiograph or examination with ureteral catheter that there is a calculus in one or both ureters and none in the kidneys and if the calculus is not situated low down in the ureter, why is it not better to remove it directly by ureterolithotomy than to do nephrotomy?

The objections to adopting this course are these: The renal

congestion and œdema, which it is very important to relieve promptly and completely, are not relieved with the same certainty as though the kidney itself were laid open. 2. The ureter may not be easy to isolate and if this is the case, we shall have lost much valuable time in the endeavour to reach the calculus and may be obliged to lay open the kidney at any rate. 3. There is always some chance that the radiograph may have presented deceptive appearances and the ureteral catheter may have misled us and that there may have been a calculus overlooked in the kidney. 4. The ureteral operation gives no opportunity for exploring the interior of the kidney and fails to supply drainage for or the chance to remedy intra-renal conditions that may require treatment. 5. If the stone is low in the ureter, near the bladder, the operation for its removal is more difficult than nephrotomy.

These seem to be sufficient reasons for making the kidney and not the ureter, the first point of attack.

Conclusions. 1. The urinary secretion of the unobstructed kidney which is normal, or but very moderately diseased, appears in a few cases to be suppressed by the influence of the so-called reno-renal reflex inhibition originating in the irritation and obstruction of the opposite ureter by an impacted calculus.

2. The proporton of bilateral to the unilateral cases of renal calculus appears to be about 30%. The relative number of cases in which both ureters are simultaneously blocked in the bilateral ones, is much larger than generally stated, perhaps as much as 20%.

3. The number of cases in which the unobstructed kidney, or both kidneys, possess a useful amount of functionally capable substance is larger than is usually stated.

4. In the absence of unfavourable symptoms and if the period of the anuria has been but a short one, the effort should be made to re-establish the urinary secretion by passing ureteral catheters into both the ureters and retaining them in position for a few hours. This step may be supplemented by the administration of saccharine, or physiological saline solution. Combining the latter with venesection probably adds to its efficacy.

5. The employment of oil injections with ureteral catheter above the point of impaction of the calculus should be given a more extended trial in the cases in which it is not known that the calculus is too large to be passed spontaneously.

6. Bilateral simultaneous nephrotomy should be given a further trial in all cases in which calculi exist in both sides whether the two ureters are simultaneously obstructed by them or not, also in all unilateral cases in which the first kidney operated upon is found to be functionally useless or very extensively diseased.

CASE 1. Subparietal laceration of the right kidney produced by an unusual form of injury. The lower end of the kidney torn from the rest of the organ. Nephrectomy on the sixth day after the accident. Recovery. Subsequent formation of a urinary fistula in the right loin. Ureter removed. Persistence of the urinary discharge. Fecal fistula forms and discharges through the wound. Fecal fistula closed by a third operation; on healing of this wound, urinary fistula also closes, and cure follows this operation.

History. A man of thirty-five years of age fell from a height of twenty feet striking on his hands and knees. The body received no blow. Severe shock, pain and tenderness in the right side of the abdomen followed the accident. The first urine passed contained blood. There was no hematuria subsequently.

Examination three hours after the accident. Marked tension of the abdominal muscles of the right side. Ecchymosis over the middle of the right side of the abdomen and extending to the loin. A tumor of considerable size in the right loin, which had increased rather rapidly in the first hours after the injury.

Diagnosis. Subparietal laceration of the right kidney, probably tearing the organ in two and involving laceration of the renal vein. This condition was conjectured from the absence of hematuria, from the rapidly increasing tumor in the loin, and from the nature of the accident, which was such as to have caused a violent, sudden, forward displacement of the kidney. The kidney is a soft, friable, heavy body attached to a relatively fixed

point by the artery which is tough and firm and by the vein which is thin and easily torn. If such a body is suddenly displaced and its attachments as well as itself subjected to the violent strain thus produced, it is probable that either the body itself, or the weaker of its two attachments, or both, will be torn, and this was exactly what was found to have happened when the kidney was seen at the time of operation.

Patient rallied slowly after the injury in spite of the continuance of hemorrhage, which was shown by the gradual increase in the size of the tumor in the loin during the next four days. The temperature was normal until the sixth day, when it rose to 102.5 F. The opposite kidney secreted a sufficient amount of normal urine throughout this time.

Nephrectomy. Dec. 5th, 1907. (On the 5th day after the injury).

The right kidney and an enormous hematoma surrounding it were exposed by a longitudinal abdominal incision parallel with and about an inch outside the linea semilunaris, supplemented by a second cut at right angles to the first extending to the outer border of the quardratus. The peritoneum was not incised, but was stripped from the abdominal parietes and from the front surface of the hematoma. The muscles overlying the latter in front were lacerated in one place and extravasation of blood had taken place into the surrounding area. The hematoma extended from the brim of the pelvis to the diaphragm. It was quickly removed by scooping it away with the hand. Upon exposing the kidney, it was seen that the lower third of the organ, together with the ureter, had been torn from the rest of it. This fragment was not discovered during the operation. The renal artery was intact, but the vein was torn across at the junction of its branches with the main stem. The latter was occupied by a thrombus. The two vessels were clamped and the kidney was cut away from them.

No bleeding took place during the operation. The clamp was left upon the pedicle on account of the critical condition of the patient and was removed on the third day. Drainage was

made in the loin and the abdominal wound was closed except for a small space at the outer end of the cross cut, through which drainage was made and the handles of the clamp issued.

Ten days after the operation it was first noticed that urine was being discharged from the drainage opening. Except for the persistence of this fistula, the patient made a good recovery. Six weeks afterward he passed into the hands of my colleague, Dr. Hubbard, who, sometime later, endeavoured to close the urinary fistula by tying off the ureter close to the bladder. He failed to find any renal substance from which the urine could proceed. The patient recovered from this operation also, but the urine continued to discharge through the loin. A month or two after this, rotation in the service brought him under the care of Dr. Thorndike. During the convalescence from the operation done by Dr. Hubbard, the patient developed a fecal fistula which discharged through the lumbar wound. Dr. Thorndike now did the third operation for the purpose of closing the fecal fistula.

This operation was successful, not only in closing this fistula, but also in arresting the urinary discharge, which had not ceased up to that time. As had happened at the two preceding operations, there was a failure to discover the missing fragment of the kidney in this, the third intervention as well, the arrest of the urinary flow brought about, together with the closure of the fecal fistula, remains unexplained. The interesting features of this case seem to me to be these:

1. The persistence of the urinary fistula. The assumption with regard to the small bit of the kidney that was not removed by the nephrectomy was that it would become necrotic, disintegrate and be discharged through the wound, instead of which, it seemingly was supplied by an aberrant blood vessel which kept it alive and which escaped injury.

2. The spontaneous arrest of hemorrhage by pressure exercised upon the renal vessels and the kidney by the large hematoma and the overlying peritoneum. There are a number of instances in which such a spontaneous arrest of hemorrhage has occurred by this means, or by thrombus formation, and in which one or

both the main renal vessels were torn. The laceration of the main stem of the renal blood vessels occurred in twenty-two cases in a series of three hundred and forty lacerated kidneys which I collected some time since. Both vessels were torn in four of these, in three the artery alone, and in the remaining fifteen the vein alone was involved.

3. Ecchymosis is not very frequent in these cases, and when it is present is usually situated in the groin and inner side of the thigh. In this instance it occupied the front and side of the middle of the abdomen. This unusual location was due, I think, to the fact that the extravasated blood came from the lacerated abdominal muscles.

4. The unusual nature of the accident, which so far as I know, is unique.

5. The absence of hematuria and its significance as indicating either complete disintegration of the kidney, its separation from the ureter or pelvis, tearing across one or another of the latter structures, or plugging of the ureter by a clot.

6. The closure of the urinary fistula which was coincident with the healing of the fecal fistula procured by Dr. Thorndike's operation.

7. The incision which was employed by me for removing the kidney and the hematoma. I have had great satisfaction from the use of the so-called para-peritoneal approach to the kidney in cases of laceration of the organ. This operation avoids the opening of the peritoneal cavity and gives—when supplemented by the right angle incision extending from it to the quadratus—the widest possible avenue of approach. This feature is, I think, a most important one, for it enables one to control the hemorrhage which is often tremendous when the peri-renal accumulation of blood clot is removed and the kidney exposed. The operator needs all the room he can have at this moment. The method has the additional advantage of permitting a thorough examination of the peritoneum and the colon and can be extended into the peritoneum at any moment, if it is seen that intra-peritoneal viscera are also involved in the injury.

CASE 2. Solitary, enormous cyst of the left kidney. The following six operations were performed upon the patient.

1. The cyst drained through the abdominal wall. (Dr. Faulkner).

2 and 3. Counter-openings to secure better drainage. (Drs. Faulkner and Watson).

4. Nephrectomy of left kidney and tying cyst off from it. (Dr. Watson).

5. Attempt to close urinary fistula which persisted after nephrectomy. (Dr. Watson).

6. Attempt to close urinary fistula. (Dr. Keyes).

Peristence of urinary fistula after these operations.

History. A man of twenty-three years of age of athletic habits who had two attacks of abdominal pain during the preceding two or three years. A third attack closely simulating appendicitis caused his entrance to the Boston City Hospital in October, 1907. Shortly afterward Dr. Faulkner made an exploratory laparotomy incision in the lower right part of the abdomen. He found an enormous single, thin-walled, retro-peritoneal cyst extending entirely across the abdomen and downward into the pelvis. The cyst wall was attached to the abdominal incision, punctured and the cyst evacuated and drained. It contained a large quantity of thin yellow fluid. The cyst was painted interiorly with iodine. Some days later the fluid draining from the incision was found to be urine. About a fortnight after the operation the cyst became infected and the patient began to lose flesh and strength and to have a daily rise of temperature.

The patient came into my hands about this time; a counter opening to improve the drainage of the cyst was made in the opposite loin. Three weeks later a fecal fistula formed and discharged its contents through the cyst and by the original wound. The drainage tube had been withdrawn from the other loin and that incision had closed so that the urine and fecal matter both passed out through the original incision.

Shortly after this two calculi were passed from the right kidney. A radiograph failed to show any other calculi in that kid-

ney or ureter. The urine coming from that kidney was normal not long afterward. The left kidney could be easily felt through the thin abdominal wall. Its position was abnormal, it being near the median line and resting upon the brim of the pelvis. No communication between the cyst and the bladder could be made out.

Nephrectomy of left kidney. Examination with a sound passed into the cyst through the opening in its right side, and palpating the left kidney externally at the same time, showed that there was an intimate connection between them.

The kidney was exposed trans-peritoneally by an incision through the left linea semilunaris. It was found to occupy the position already mentioned and was much smaller than normal. Its blood vessels were irregular, there being no main arterial or venous stem, but small vessels which entered the organ at different points upon its surface. Its lower pole was firmly attached to the cyst wall which apparently originated in the kidney, and was, so far as could be determined, an eaxmple of a solitary cyst of the kidney. Its walls were thickened by the inflammatory changes that had taken place in them. The cyst was freed from the kidney as far as possible and ligated at that point and cut off from the organ.

The removal of the kidney was exceedingly difficult owing to its abnormal position, to its irregular blood vessels and to the numerous adhesions by which it was bound to the brim of the pelvis. The removal of the cyst itself did not seem to me at that time safe to undertake, nor did I think it probable that it could be done. The condition seemed to be that of a solitary cyst proceeding from the lower pole of the kidney.

The abdominal wound was closed without drainage. Following the removal of the left kidney, the urinary discharge from the fistula of the original operation ceased, and the fecal fistula also closed in the course of the next twelve days.

On the thirteenth day, the nephrectomy wound became infected, owing to the giving way of the ligature which had closed the opening made in it when it was cut away from the kidney.

The wound was reopened and drained. A day or two afterward it was seen that urine was flowing from the drainage tube. Suppuration soon became very little but the urinary fistula established in the new position continued to discharge. The patient's general condition rapidly improved and he gained fifty pounds in weight during the next six months.

In the autumn of 1908, about a year from the time of his first entering the hospital, he returned to me with the request that the effort be made to close the urinary fistula.

Examination showed that the fluid from the bladder and from the cyst both contained pus, very little in the former and variable in amount. The urine from the right kidney showed that it was fully capable functionally. Examination with cystoscope by Dr. Hugh Cabot led him to think that there might be a communication between the bladder and the cyst. Both Dr. Cunningham and I failed to arrive at this conclusion, however, upon subsequent examinations. Several trials were made by injecting coloured fluids into the bladder and again into the cyst, but in no instance did the colour pass from the fluid of one to that of the other. The urine from the bladder showed the colour change within the normal time limit, after administering methylen blue, but the urine from the cyst was not coloured at all.

A radiograph was taken in the X-ray department of the Boston City Hospital by Dr. Williams, Dr. Cunningham having injected the cyst with bismuth and inserted a styletted ureteral catheter into the right ureter. The accompanying illustration shows the conditions that were present at this time. The right kidney and ureter are seen to be wholly unconnected with the cyst and well removed from its neighborhood. The dark mass is the bismuth injected cyst which had then shrunk to a very small size compared with its original dimensions. The extension from its left side is the drainage tube lying in the fistulous tract, the point at which it joins the cyst being that at which the cyst was cut away from the left kidney. From the above data it seemed clear that a bit of the left kidney must have been still left attached to the cyst and that it was the source of the urine which

had been discharged from the cyst since the nephrectomy. It was decided to try to remove what remained of the kidney if it could be found by another operation.

Third Operation. The abdomen was opened through the right linea semilunaris immediately above the cyst, the cyst exposed by dividing the peritoneum overlying it and brought up into the abdominal wound. Its exterior was then carefully examined, a sound being at the same time in the bladder. No connection with the bladder was to be found, nor could anything resembling renal substance be discovered. The cyst was then attached to the abdominal incision and opened. Exploration of its interior resulted as had that of the exterior, in finding nothing that was susceptible of being removed or attacked with prospect of benefit to the patient. Drainage was therefore made through the new and more direct opening, and the former fistulous opening soon afterward closed.

DISCUSSION

Dr. Edward L. Keyes, Jr., of New York. All I have to say about this case is very brief. I examined him first of all by the cystoscope, and found that any sized catheter went readily into the right ureter, but a No. 2 could not be introduced either by myself or Dr. Barringer into the left ureteral orifice, although this was normally placed. We endeavored to collect the urines separately by placing a catheter in the right ureter, a rubber tube in the abdomen, but the urine flowed by into the bladder. During the test, however, we injected phloridzin, 1 c. c. of a 1 per cent. solution, and obtained from the right kidney urine sugar in fifteen minutes. We did not obtain the sugar in sixteen minutes from the drainage tube side, but we did in seventeen minutes. This was interesting, showing, according to the phloridzin test, that if two kidneys were present, they were of equal value. I then performed the experimental polyuria test, of which I shall give the details in my paper. It showed that the left kidney was present, but gravely impaired. Doubtless it is only a small fragment of kidney tissue.

Dr. Watson in closing. Dr. Keyes is quite right in saying a small fragment, because at intervals I inspect this kidney on the shelf in my office, and I know very well that there was not much of it left behind when

I operated, but that there is some renal substance that was not removed by my operation, I have no doubt.

Dr. Hugh Cabot of Boston. If I understand Dr. Watson correctly, in the early part of his paper he said that hydronephrosis does not occur after complete stoppage of the ureter; that the kidney goes on to atrophy without the production of any considerable hydronephrosis. Some recent experimental work by Dr. Barney of Boston on the ligation of the ureters in animals shows that hydronephrosis does occur. He undertook it without any prejudice, and assumed that he was going to get atrophy. He was very much surprised at his results. Of course, I think it is to some extent unsound to draw conclusions from animal experimentation, but it at least suggests that that statement, which has been quoted extensively, ought to be reviewed.

Dr. Watson in reporting a case of mine makes one slight error. The anuria occurred upon the eighteenth day after the operation, and not upon the fourth.

Dr. L. Bolton Bangs of New York. This topic interests me very much. I have not had a very large experience, but a very interesting one. First let me say, apropos of what Dr. Hugh Cabot has just said, I had one case of rather large hydronephrosis following obstruction by a calculus, and I was obliged to drain that man's kidney for a number of years. He was so comfortable that he refused nephrectomy.

As to calculous anuria, I should like to speak of an experience which certainly was very instructive to me, and yet I cannot see how I could have done any differently, although I must confess that the use of the ureteral catheter for restoring the function of the remaining kidney was not known to me at the time of my operation. Briefly, then, I operated upon a patient who had for seven or eight years given a history of calculi in the right kidney. When he came under my care the radiograph revealed the true condition of things, and I cut down upon the kidney and, finding it was disorganized and nothing but a sac containing a large stone and the usual amount of pus, I did a nephrectomy, from which the patient recovered very well indeed, considering his debilitated condition, and he left the hospital on the eighteenth day with his wound healed. Twenty-four hours later he had a sudden attack of very sharp pain in the left kidney, and progressive anuria. At first there was secretion of a few drops of urine. The bladder was absolutely empty. Although the radiograph of that kidney had not shown any stone, I felt confident from the sharp attack of pain and the anuria that we had in the left kidney another

stone causing obstruction of the ureter. So, after waiting about seventy-two hours, and finding that the man was becoming somnolent, I hurried him again to the hospital, and on the same evening opened the left kidney. I could find no stone; I could find no obstruction of the ureter. The kidney was hypereremic, but I could find no pathological changes in it; although I laid it wide open, I could find no obstruction. The kidney bled very profusely, and we brought it together and put him to bed, and in the next twenty-four hours he voided thirty-six ounces of urine, which was bloody, with a high specific gravity, and, I think free from epithelia, although I do not remember exactly. At all events, that anuria was relieved, and the dangerous conditions subsided immediately. As I say, the primary operation and the radiograph had revealed a calculus in the lower part of the right ureter, and at the time of the nephrectomy I had carried my incision forward to enable me to reach this calculus, when the man who was giving the anesthetic warned me that the patient was in a bad condition, and I desisted. Consequently in the interval which had supervened between the primary operation and this attack of anuria, I had had no opportunity, although I had proposed it to him that when he was in condition for it I would remove the stone from the right ureter. Now, the subsequent events were extraordinary to me. Although this stone was supposed to be in a dead ureter, and he never complained of it in the slightest degree, notwithstanding I examined him repeatedly in reference to it to find any local tenderness or any symptoms by which the subsequent events could be explained, he never was in a condition to warrant me in operating upon him to remove that stone, and he finally died of a series of pus formations which I never could control. He had, without any known cause, suppuration in the prostate, subsequently in the testicle of the opposite side; he seemed to be generally infected; and what the fault of my technique was, or whether it was from this stone in the dead ureter, I never could solve, and no autopsy was allowed me.

Dr. A. T. Cabot of Boston. I want to speak of my personal experience with calculous anuria, although I think many of the members know what I have written on the subject, which covers mainly what I have to say. I have had three cases of total anuria. In all of them there was good reason to believe that the other kidney was useless. In one of them the kidney had been removed for a tubercular condition. In another a subsequent cystoscopy showed nothing but pus coming from apparently an old suppurating kidney. The anuria existed in the shortest case about two days and in the longest seven days. In all three of the cases the calculus

was dislodged into the bladder, and subsequently was passed or pumped from the bladder. In two of these cases the manipulations which led to the displacement of the calculus, and restored the power of urinary secretion, were during the operative procedure; the examining of the ureter in search for the calculus being sufficient to dislodge it. The third case, the one which had one kidney, the other one having been removed, was a woman. I saw the case in consultation with another surgeon. He had examined her just before I arrived at the consultation, had felt a little hard mass through the vagina, and had examined it pretty carefully. We both examined her, and it could not be found. Then, debating what to do, I suggested that we should now put in a catheter and see if the secretion of urine has been restored, and we found two drams of good looking urine. From that time the renal function was established and the calculus was subsequently passed.

I propose to read a paper before this Association upon manipulation as a means of removing calculi from the lower end of the ureter. I have several cases to report in which the manipulation has been successful.

In view of this experience I would urge that, while waiting to be sure that the anuria is complete, an endeavor be made by massage over the abdomen and also by massage, as far as possible, through the rectum in the male and through the vagina in the female, to see whether any relief can be obtained in that way. It was so striking in several cases that I have seen that it seems to me a maneuver worth trying in similar cases. Of course, I do not mean that in a case which requires operation that operation should be delayed a minute, but during any necessary delay I think it is well worth trying, and I think in some cases it will be found successful.

DR. WATSON in closing. With regard to the experiments of Dr. Barney to which Dr. Hugh Cabot has referred, it would seem that they should be carefully confirmed before receiving credence, since they are, so far as I am aware, directly opposed in their results to those obtained by almost all, if not every other experimenter who has hitherto made them.

I am glad that Dr. Arthur Cabot called attention to the desirability of external manipulation in the line of the ureter for the purpose of dislodging impacted calculus. I have on one occasion been successful in securing the expulsion of a calculus by this means which he has advised. It certainly should be tried before restoring to more radical measures.

One other point to which I did not refer in my communication, and which I hoped might be brought forward in the discussion, is that of the

liability to error that occurs in radiography, which should always be borne in mind, more especially the liability to mistake the shadows made by phleboliths, endarteritis, fecal concretions in the appendix, etc., for calculi.

THE TECHNIQUE OF OPERATIONS ON THE LOWER PORTION OF THE URETER

By C. L. GIBSON, M. D., of New York.

IN performing any operation, but more particularly in the abdomen, a sufficient exposure of the operative field is necessary for efficient and safe work. There are few parts of the body where it is so difficult to obtain these conditions as in operations at the pelvic outlet; particularly when seeking to remove stones situated in that portion of the ureter which lies below the pelvic brim. Of course it is easy enough to make a ruthless incision, which resembles the technique of the morgue rather than the operatory room; but in this country certainly, we very justly do not consider that the mere completion of an operation spells success,—we judge its value by the end results. For certainly it cannot be said to be a gain for the patient to have the trouble caused by the presence of an ureteral stone replaced by a huge and weak scar, which permits eventration of the abdominal contents, a condition of permanent danger and discomfort.

In work which entails opening of the ureter I assume that the weight of evidence is in favor of procedures which do not permit urine to find its way into the peritoneum. Other debatable points are: Shall we attempt to close an intentionally opened ureter? and; Shall we provide prophylactic drainage against a possible urinary leak? In other words shall we deliberately relinquish the opportunity to secure complete closure and union of this abdominal wound?

In my judgment the ideal method of performing operations on the lower ureter should fulfil the following conditions:

The incision of the abdominal wall should be of such a size and situation as to give an ample exposure for the easy recognition

of the ureter, the necessary manipulations and security from injury to the other pelvic strictures, particularly the iliac vessels.

The incision should be extra-peritoneal.

It should be possible to make the ureter so freely accessible that any incision in it can be as easily and accurately repaired as a lesion of the intestine. Also that there should be no unecessary trauma or malhandling of the tissues, so that the completion of the operation leaves a perfectly dry field, doing away (when the continuity of the ureter has been restored) with the necessity of any drainage—a prophylactic measure against subsequent hernia.

The incision of the abdominal wall should be so planned as to produce the least damage, allowing us when it is closed without drainage, to expect a firm union without subsequent risk of hernia.

And finally, the whole operation should be so simple, so free from annoying hemorrhage, or other pitfalls, that it can be performed without undue waste of time—say in half an hour or less.

These ideals I believe can be realized by a suitable exposure of the ureter and the lower pelvis through an incision which I offer for your consideration.

The description of the incision and the various steps is as follows:

The original idea of the incision was to utilize the advantages of the Stimson-Pfannenstiel incision, which is used frequently, particularly in gynecological operations. I have used it in probably a hundred such laparotomies and believe it is the least liable to be followed by hernia.

Familiarity with the anatomy of the abdominal wall and abdominal incisions generally, will be necessary for a successful execution of the several steps.

The skin incision runs from the mid line about a finger's breadth above the pubes, horizontally outward nearly parallel to Poupart's ligament at first and curving rather sharply outward at its mid point to end about opposite to the anterior superior spine of the ilium. This incision is deepened in the same line through the aponeurosis of the external oblique and

the internal oblique—the latter is the only structure which suffers any real damage, and only to a slight degree, for the lower part of the incision runs about parallel to its fibres, only the ascending leg cuts across a small part of these fibres. The incision stops short of the transversalis, which is not disturbed at all. With sufficient retraction of the upper flap, the external border of the rectus muscle is identified and the fascia of the transversalis is now divided by a vertical incision close to and parallel to the rectus—that is, at right angles to the original incision. Two retractors are now inserted, the outer one retracts the cut edge of the transversalis outward, the other pulls the rectus muscle well toward the mid line. A generous space is thus obtained situated well toward the mid line (remember that the lower part of the ureter is practically in the mid line, difficult of access by other extra-peritoneal exposures). The floor of this space is occupied by the peritoneum. The patient being in a complete Trendelenburg position, the peritoneum is easily and gently pushed away, and we now have a free access to the pelvis. So ample is the space that the whole hand can be introduced under the control of the eye. The ureter is released from its surroundings and easily brought to the external level of the wound. In this way it can be handled as rapidly and freely as a loop of the intestine.

After removal of the stone, the ureter is closed with a double layer of the finest chromicized catgut, the first going through all the layers, the superficial sutures reinforcing the first.

The ureter is dropped back; the operative field, protected by a gauze pad during the internal manipulations, will be found perfectly dry.

The wound is closed without drainage: Suture of the transversalis fascia separately with catgut. Continuous suture with medium sized (preferably moderately chromicized) catgut of the combined internal and external oblique layer. A few interrupted fine catgut sutures to the superficial fatty layer. Very fine continuous silk suture for the skin. Sterile dressing. Firm binder. Rest in bed for ten days, when if our asepsis has been unimpeach-

able, the wound is firmly healed and the patient resumes his usual activities.

That these ideals can be realized is demonstrated by a brief recital of the following cases:

W. W., 62. Male. Admitted to St. Luke's Hospital, Nov. 13, 1907. For the past two years has had a dull pain over the sacral region. The urine is cloudy and sometimes bloody. An X-ray showed the presence of a large stone (18 grams) in the lower left ureter.

Operation Nov. 14, 1907. Under ether anesthesia the stone is easily palpated per rectum. Removed according to technique first described.

Time of operation thirty-five minutes. Convalescence uneventful. Highest temperature per rectum 100 2/10. Wound healed by first intention. November 29th, allowed up. December 3rd, discharged cured. Remains under observation. Last examination, May 26th, 1909, scar firm, no hernia.

P. M. Male, 38.

Admitted to St. Luke's Hospital, March 11, 1908, having been previously in the hospital for the same trouble. The hospital X-ray technique had failed to find a stone, although the symptoms were classical. I invoked the kind assistance of Dr. E. W. Caldwell, who promptly located the stone in the lower part of the left ureter.

Operation March 17th, 1908, by technique described above.* Convalescence uneventful. Highest temperature 101 2/10 the day after operation. First dressing, March 24th, wound well healed. March 27th, allowed up. March 30th, feeling very well, allowed to go home. Discharged cured. Remained under observation. Examination May 27, '09, shows scar firm. No hernia.

DISCUSSION

Dr. Hugh H. Young of Baltimore. This is certainly a very interesting paper, and it brings up a novel and very interesting method of dealing with the abdominal wall. It seems to me that the incision is an

* Time of operation twenty-eight minutes.

ideal one when the calculus is located below the pelvic brim, and particularly where it is located in the region of the bladder, the so-called juxta-vesical region, but for calculus located above the pelvic brim, and particularly when located within an inch or two of the kidney, it seems to me to invite injury to the muscles in quite a dependent part of the abdomen, whereas it is possible to reach those calculi by an incision which is very much higher up. In a recent case I operated through an incision all of which was above the iliac spine, and a very much shorter incision than the one shown here. The scheme of going through the muscles in different directions is certainly very commendable. There is no doubt that we have proved now for several years that it is possible to reach a stone of any depth in the ureter through an extra-peritoneal iliac incision. In one of my cases in which the ureteral calculus was in the juxta-vesical portion of the ureter I found after I had removed the calculus that there was a tight stricture just below it in the bladder wall which could not be dilated, and through this same incision I was able by stripping back the peritoneum to expose the wall of the bladder on one side, to see the vas deferens running along the vesical wall, to pick up the bladder, draw it into the wound, make an incision and divide the stricture in the intramural ureter. The bladder and ureter were closed, and there was no leakage afterward. (This case was reported in the *Annals of Surgery* for 1903.) I have sewed up the ureter in eight cases after the removal of ureteral calculi, and none of them has leaked. I have not as yet had the hardihood to close the abdominal muscles and skin without drainage. In the case I did five or six weeks ago there was a slight accumulation of bloody serum which drained out through the very small opening left for a small cigarette drain. I should think it would always be advisable to put a small tube in or a wick of protective, because the accumulation of bloody serum or the possible extravasation of urine might lead to a good deal of trouble, particularly when we are dealing with a patient with an infected kidney in which even the escape of a small amount of urine at operation might lead to suppuration.

DR. A. T. CABOT of Boston. I fancy that in Dr. Gibson's cases the ureter was a good deal dilated, was it not?

DR. GIBSON. Somewhat, but not markedly.

DR. CABOT. I have never happened to have a stone of large size in that part of the ureter. In one of the first cases which I operated on many years ago the ureter was so small that I felt, and still feel, that suturing would have seriously narrowed it. In that case I incised, put drainage

down to it, and it got well as quickly as many cases that are sutured. It was a small calculus, not larger than a kidney bean, very rough on the surface, and the pain being excessive the patient had been under ether for twenty-four hours when I saw him, and he was getting exhausted. We operated for the relief of that pain.

I have had two cases of operative removal of stones in the very lowermost end of the ureter through the bladder. The last one was interesting, in that the cystoscope showed a cystic condition of the mucous membrane about the ureteric orifice, so close to the prostate that I was not sure it did not originate from the prostate, as I had recently had a cyst of the prostate just in that position. On opening the bladder the condition was readily made out and the stone was removed. The symptoms had been existent for many years.

Dr. Francis S. Watson of Boston. I only wish to say that the method of approaching and removing calculi from the lower end of the ureter, which Dr. Gibson has described to us, appeals to me at once as being admirable, and I hope I may have the opportunity to make use of it.

Dr. Hugh Cabot of Boston. I am extremely glad to have heard this paper, and think it is a distinct extension of our technique. If I had been familiar with this method I should have saved a patient a somewhat weak scar. She had a stone in the lower end of the ureter. It could be felt by the vagina, and yet was apparently movable, as it would disappear and then come back again a few hours later. I used an incision that did not come so far forward as Dr. Gibson's and it was distinctly difficult to get at the lower end of the ureter. I was impressed in this case by the fact that in stripping up the peritoneum the ureter is very apt to go with it, an observation made some years ago by Dr. A. T. Cabot. The ureter was dilated, and I floated the calculus up and took it out. By my incision I should have had greater difficulty in getting the lower end of the ureter than by the use of Dr. Gibson's incision.

Dr. James Pedersen of New York. Dr. Arthur Cabot's remarks upon a cystic condition at the lower end of the ureter, brings to mind a case in which the cystoscopic examination showed a prominent projection into the bladder. On account of the history of marked intermittent hematuria, with no distinct pain such as would suggest a stone in the ureter, a tentative diagnosis of neoplasm was made, corresponding to the cystoscopic picture. The patient disappeared from observation and returned five or six months later. I made a second cystoscopy, and at once made a diagnosis of probable stone in the lower end of the ureter, bulging the bladder

wall forward. The cystic or oedematous appearance had disappeared. Dr. Lewis Gregory Cole made a radiograph. It showed a stone in the extreme lower end of the ureter. The patient was under Dr. Bangs' observation, and through his courtesy I had the opportunity of making these observations. We tried to dislodge the stone by injecting oil through the ureteral catheter. It was very difficult to enter the ureteral mouth, which was distorted and deflected. By using the opposite ureteral catheter, across the bladder, so to speak, it was accomplished. The injection of oil gave no result. Immediate operation was advised. This the patient refused, and again disappeared from our observation. Subsequently, he shifted allegiance and the stone was, I understand, easily removed suprapubically.

Dr. Francis R. Hagner of Washington, D. C. I have been very much interested in this new incision, making it possible to easily explore the lower end of the ureter. I had a case some years ago exactly like Dr. Cabot's case where there was a calculus in the lower end of the ureter which could be floated up, the ureter incised, and the stone taken out.

About three weeks ago I had a lady with a calculus two and a half centimeters from the ureteral opening. The ureter catheter stopped there, and the X-ray showed a calculus. I operated upon her, and there was a small calculus about one and three-quarters centimeters in length and one-half a centimeter wide. It was absolutely fixed. There was a considerable amount of peri-ureteral thickening, and I could not feel the calculus at all. I was sure it was there, so I opened the ureter above, put a ureteral catheter down, located the stone, measured the distance, and then removed it. I could not suture that ureter at all. I simply made a small opening, delivered the stone, and then put in a drain. Leakage occurred for only twenty-four hours, and after that it absolutely stopped. I think that has been the experience of many men. Of course, if you can suture the ureter it is better than to leave it open. I feel better to have a little drain.

Dr. L. Bolton Bangs of New York. I think this is a very interesting incision. I would like to ask to what length of the ureter it gives access? In laying out an operation in regard to a stone in the lower part of the ureter very far down I came across a plan devised by Dr. Whitmore of St. Louis. I had no opportunity to put it into practice, and I would like to know whether it has been used by any of the members of this Association. His was a vertical incision at the endge of the rectus muscle on the corresponding side, and he claimed that it was extra-peritoneal. The peritoneum could be reached very readily and stripped upward and

backward, and he claimed that it gave him access to four inches of the lower end of the ureter, starting from the bladder.

Dr. F. Tilden Brown of New York. As even a single experience in any new procedure seems to be worth recording, I would like to state that I have had to do with this procedure of Dr. Gibson's, in a recent case, and to introduce my remarks by saying that I cannot imagine anything which is more gratifying in affording access to this portion of the ureter than this particular incision. Everything about it appeals to me, the open access given, and the promise of integrity of the abdominal planes after suture. In this particular case there was a great question as to the nature of the object which we—Dr. Osgood and I—felt sure was a stone, but the same leading expert in radiography, Dr. Caldwell, because of its abnormal stereoscopical appearance was in some doubt. His stereoscopical picture showed this object on a much more anterior plane than a body in the ureter ought to occupy. He was right and we were right. It was a stone which had escaped from the ureter and was inclosed in a small abscess cavity at the edge and partly underneath the psoas and iliacus muscles. The operation was attended with some difficulty in detaching the ureter from its long associated relationships, and resulted in a tearing into the peritoneum. Although we could not repair it by suturing, on account of injuring the vessels there, packing was sufficient to prevent a hernia, although at the time of operation the gut protruded. I would say that the ureter had been occluded. It was impossible to pass a catheter, inserted from the wound, down into the bladder. The ureter was severed from its attachment to the bladder, and the defect owing to the ulceration in connection with the migration of the stone was cut off. And this incision permitted also of a splendid management and stripping of the peritoneum further up so as to turn the ureter out retro-peritoneally about midway between the costal border and the superior spine. I think anybody who uses this incision with, as Dr. Gibson says, an adequate Trendelenberg posture and a good light, will feel that he has complete mastery of the case.

Dr. Louis E. Schmidt of Chicago. I can see the distinct advantage of this kind of an incision over the ordinary incision made from the last rib to the spine of the pubes. The rest of the operation, if I understand it correctly, is simply a muscle splitting operation that MacArthur devised ten years ago. Only within the past week I operated in a case for stones in the ureter, within three-quarters of an inch from the bladder, and I used the incision mentioned and the muscle splitting device that MacArthur

has recommended. If the incision permits of easier and quicker accessibility, I can see that the incision is of distinct advantage and importance. But according to the diagram the external border of the rectus muscle is entirely too near the median line. It comes over farther in the majority of well developed men, and with this incision shown in the diagram you would have to incise the muscle transversely in order to reach the vesical end of the ureter—at least in some cases.

Dr. H. A. Fowler of Washington, D. C. I want to relate an experience which I had in my first case of stone in the ureter. This was a young man, about twenty-eight, who came presenting the symptoms of stone in the bladder. We were misled in this case by the X-ray in thinking that the stone was higher up in the ureter. It seemed to be about midway between the bladder and the kidney. Consequently the incision was begun much higher. We found in palpating the ureter that the stone could not be located in the position where we expected it, and we then explored higher and were still unable to find the stone. We then extended our incision lower—an extension of the Israel incision, which is very similar to the incision which Dr. Gibson has given us in these illustrations, and we were able to find by tracing down the ureter, a small stone lying loose just above the bladder wall. Fortunately the ureter was slightly dilated, and we were able to milk the stone out to a position where it was very easily accessible, and we were able to suture the ureter in that case. I think this incision in those cases in which the stone can be definitely located in the lower end of the ureter is an exceedingly good one. In a recent experience, with the stone lying higher up in the ureter, about four inches below the kidney, we were able to expose the ureter by an incision very much higher than the one indicated here. We were able to expose the ureter under cocain, and then, giving the patient a few whiffs of ether, we were able to rapidly remove the stone, followed by complete recovery.

Dr. Gibson in closing. In answer to Dr. Bang's question, I would say that the lower ureter is accessible right down to its termination in the bladder. Also that this operation is planned only to give access to the pelvic ureter. You perhaps have noticed that at no time in describing the operation did I claim originality. Whatever has been done is merely an application of several other points. It is just simply this: I have never seen it just as described before, and from a familiarity with the practice of many surgeons of this country and abroad I have never seen an operation just like this. Moreover, a good many operations I have seen have been rather painful to witness in the way of a obscure, dark, deep, bloody,

mysterious field, whereas in this procedure the ureter can be brought right out on to the skin of the abdomen. Therefore, I have no hesitation in sewing it up and dropping it back. When one opens up the intestine and sews it up one does not drain the abdomen, and I have just as much confidence in sewing the ureter as in sewing a loop of intestine.

HYPERNEPHROMA OF THE KIDNEY—REPORT OF A CASE

By H. A. Fowler, M. D., of Washington, D. C.

NEW growths of the kidney are fortunately rare, as compared with those occurring in other situations. This fact is best illustrated by the records from the pathological department of large hospitals. Where such statistics are available for study and comparison it is found that renal new growths, as the cause of death, form only a small percent. of the cases of malignant disease. Thus the records of the Anatomico-Pathologic Institute of the Trieste Civil Hospital published by Ravasini show that during the decade 1897-1907, 10,034 sections were made. Among these there were 22 cases of tumor of the kidney and adrenals, or 0.21%. Malignant disease was the cause of death in 1083 cases or 10.79%. Hence malignant tumors of the kidneys and adrenals formed only 2.03% of the cases of malignant disease in this series. In the same series malignant disease of the gastro-intestinal tract and female genitalia formed 44.32% and 20.49% respectively.

While these statistics indicate that tumors of the kidneys are very uncommon, yet one must believe that if the cases from the surgical clinics were included the percentage would be greatly increased, because many of these cases are admitted to the surgical wards, are operated upon, and leave the hospital well. Indeed, in the series of cases collected by Garceau from the autopsy and operating room records of the Massachusetts General and the Boston City Hospitals we find that while there were only 3592 sections made, there were 91 cases of renal neoplasm, or 2.5%. This relatively large number is undoubtedly to be explained by the

fact that the specimens from the operating room were included. In any case, however, the fact remains that malignant disease of the kidneys is comparatively rare.

It is abundantly evident from an examination of the current literature that hypernephroma is the most common form of malignant new growth of the kidneys. This fact is most striking when we consider that up to a few years ago only a relatively few cases were reported. In the current literature the number of cases of sarcoma and carcinoma are steadily diminishing while the reports of cases of hypernephroma are incerasing in frequency.

Formerly tumors of this kind were described under a variety of names by different writers. These varied according to the interpretation of the histologic structure observed and the theory of histogenesis adopted. Thus they have been reported under such names as, strumæ suprarenales, lymphangioma, perithelioma, adenoma carcinomatodes, adenocarcinoma, angiosarcoma, *adénome à cellules cylindriques,* alveolar adenoma, pseudolipoma, strumæ lipomatodes aberratæ renis, endothelioma, epinephroid, and *epitheliome à cellules claires.*

Grawitz, in 1883, showed that the tumors now designated as hypernephroma resembled in their microscopic structure the tissue of the adrenal gland, and he contended that these growths had their origin from misplaced adrenal tissue which is commonly found just beneath the capsule and in the substance of the kidney. This was a new conception of the pathology of these tumors. This view, which was vigorously assailed at first by some observers, and confirmed by others, is now quite generally accepted. This form of new growth is frequently referred to as the Grawitz tumor.

The term hypernephroma was introduced into pathology as recently as twelve years ago. Credit for first having employed it is given to different writers. Kapsammer in his "Nieren Diagnostik und Nieren Chirurgie" states that it originated with Bergstrand (1897). Kaufmann of Basle says the term was first employed by Birch-Hirschfeld to designate those small tumors of the suprarenal gland characterized by a hyperplasia of the gland

tissue. Garceau tells us we are indebted to Lubarsch for its introduction. Whatever its origin, it has now come into quite general use, although some writers, Küster for example, still adhere to the terms which they first employed. Küster calls the small benign tumors of the adrenal, due to hyperplasia of the gland tissue, an epinephroma. Those tumors arising from misplaced adrenal tissue he calls epinephroid. He insists these are superior to the term hypernephroma and sees no reason for abandoning them. In France this type of tumor is called by the descriptive name of *epitheliome à cellules claires.*

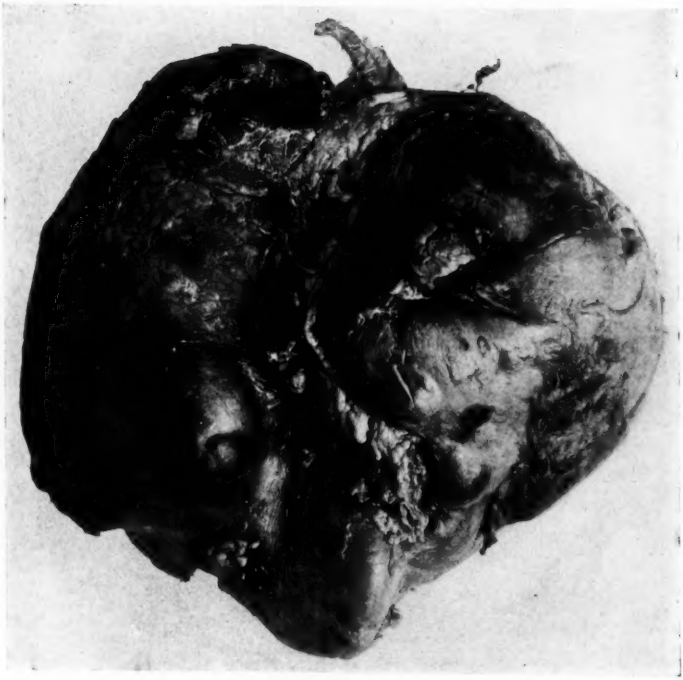
It is somewhat difficult to define the term hypernephroma owing to the fact that these tumors present histologically a very complex structure. In general, however, we may say a hypernephroma is a tumor which, while showing a great variety in histologic structure, presents, in general, the structure of adrenal tissue. It is applied to tumors arising in the adrenal gland itself or elsewhere in the body.

Misplaced or detached adrenal tissue, the so-called "adrenal rests" has been found very commonly under the capsule of the kidney and even in the substance of the gland itself. It also occurs in the renal and solar plexuses, broad ligament, ovary, retroperitoneal tissue, liver, testicle, and along the spermatic vein. Hence primary hypernephromata may develop in any of these situations. But the most common site is in the kidney.

The literature of hypernephroma is already extensive. This condition is interesting alike to the surgeon and to the pathologist: to the former because, though relatively uncommon as compared with other surgical diseases of the kidney, or tumors of other parts of the body, it is the most frequent form of malignant disease of these organs, and because it presents such striking peculiarities in its clinical course and offers so many difficulties to a correct diagnosis. To the pathologist it is of great interest because of the great variety of histologic structure presented, and the great difficulty experienced in the attempt to give a satisfactory classification.

In the earlier studies particular attention was directed to

PLATE XI.—Presented by Dr. H. A. Fowler.



the pathology of these growths. This was quite natural as they exhibited the most interesting and complex structure. As the number of case reports increased, we find elaborate papers dealing more particularly with the clinical features. Analysis of a considerable series of cases which have been carefully followed reveals a number of peculiar and interesting features which appear to be quite characteristic of hypernephroma. Certain of these peculiarities are difficult to understand and so far the pathologists have offered no adequate explanation. These will be referred to later on.

The history of our own case is as follows:

G. B., aged 56 years, white, American, came under observation in December, 1908, complaining of a "run down condition." He gave an excellent family history containing nothing of importance in the present connection.

Past History. In the spring of 1904 he had an attack of hæmaturia. One night while going up stairs to retire he was suddenly seized with an intense desire to urinate. On voiding he noticed the urine was bloody. Once during the night he voided bloody urine, but on the following morning it was again clear, and he felt perfectly well. Associated with this attack of hematuria there was no other urinary disturbance. There was no history of trauma preceding the attack, nor could any other reason for its appearance be given.

Two years later a second attack occurred, coming on in precisely the same way. During the interval between attacks nothing unusual or abnormal was noticed. He has never noticed blood in the urine except on these two occasions, and he felt strong and well up to the past summer. There has never been any other symptom referable to the genito-urinary tract.

Last summer (1908) he began to complain of gastro-intestinal symptoms, belching, a feeling of distention, soreness, and distress in the abdomen, loss of appetite, and a gradual loss of weight. About this time he began to have night sweats. These occurred soon after the patient fell asleep, he would awake soon after falling asleep all wet with perspiration. These continued

on and off up to the time of the operation and were extremely annoying and disagreeable. About the same time, or a little later, he began to be troubled with a dry hacking cough, worse at night on lying down, sometimes preventing sleep. During the summer and fall he had lost twelve pounds in weight. He felt weak and became easily exhausted on slight exertion. In December, 1908, a tumor was accidentally discovered in the right abdomen, and he was referred to me for examination.

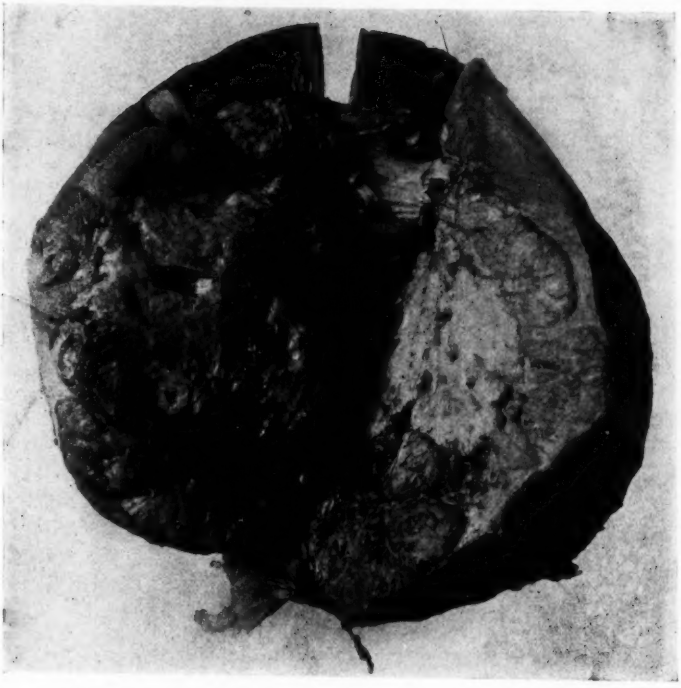
Examination. Thin, spare built man with a sallow complexion, suggesting beginning cachexia. Heart and lungs negative. External genitalia normal except for a slight enlargement of the veins of the right scrotum. Urine clear, acid, sp. gr. 1015, a mere trace of albumin, no sugar. In a centrifuged specimen an occasional red blood cell was seen. There were no casts and no infection.

Abdomen. In the right abdomen is a mass easily seen on inspection, slightly projecting about the level of the umbilicus. This mass is oval in outline, with its long axis pointing downward and forward from the right loin toward the left groin. It reaches to within two fingers of the midline. It is smooth, firm, regular, not tender, and the fingers can be pressed down between it and the border of the ribs. It is freely movable on bimanual palpation, and does not move with respiration. The percussion note over the mass is tympanitic. The left kidney is not palpable. Otherwise the abdomen is negative.

Cystoscopic Examination. Inspection of the bladder reveals nothing abnormal. Urine was seen escaping from both ureteral orifices. A catheter was passed to the pelvis of the right kidney, a catheter in the bladder collected the urine from the left kidney. The examination of the separate urines was as follows:

Combined.	Color.	Right.	Left.
Clear, amber.	Reaction.	Very light, turbid.	Very light, turbid.
Slightly acid.	Urea.	Neutral.	Neutral.
.012.	Microscopic.	.007.	.005.
Occasional red cell, no casts, no infection.	Indigo carmine.	Blood, epithelia.	Blood, epithelia.
		No casts.	No casts.
		No infection.	No infection.
		18 minutes.	22 minutes.

PLATE XII.—Presented by Dr. H. A. Fowler.



The amouut of urine obtained from each kidney was not accurately measured, but was approximately the same and was large in amount. The twenty-four hour specimen measured 2760 c. c. The patient habitually drank large quantities of water. On several examinations there was no blood in the centrifuged specimen.

The blood in the urine from the right kidney was due to the catheter, while that obtained from the bladder was due to trauma by the cystoscope at the neck of the bladder. It is interesting in the light of the findings at operation, that the urine from the two sides showed so little difference. It is astonishing that a kidney so nearly destroyed, containing such a relatively small amount of actively secreting substance, should excrete urine comparing so well with that from the other (healthy) side. Furthermore it is noteworthy that the indigocarmine appeared in the urine from the diseased side four minutes sooner than in that from the healthy kidney. This experience adds emphasis to the well known fact that the functional tests in general are unreliable in cases of tumor.

The results of our examination of the separate urines were at first misleading in that they raised a doubt whether after all the tumor involved the kidney to any extent. But the evident connection of the mass with the kidney, as made out on palpation, and the history of hematuria convinced us that we were dealing with a tumor of the right kidney. The slow growth of the tumor, and the character of the hematuria seemed to justify the diagnosis of hypernephroma. In this diagnosis the patient's brother, a well known surgeon, concurred. Accordingly nephrectomy was advised and accepted.

Operation. The tumor was exposed through an oblique iliolumbar extraperitoneal incision. The peritoneum was closely adherent to the growth on the anterior and inner surfaces. The fatty capsule was transformed into a dense network of dilated veins. Hemorrhage was quite sharp in freeing the tumor from the peritoneal adhesions and the fatty capsule. The ureter was ligated and divided at the lower angle of the wound, the pedicle

was caught with clamps and the tumor removed. Remnants of the fatty capsule were then separated from their peritoneal attachments and removed. No enlarged glands were found. Closure in layers with a small wick drain. Convalescence was smooth and rapid. He left the hospital on the twentieth day, and after a short rest of a couple of weeks, returned to his office. At the present time, four months after the operation, his general condition is good. He has gained only a little in weight (fifteen pounds), but his color is better, he has regained his appetite, and in general fells well.

Gross appearance of specimen. The specimen is irregularly oval in shape and is composed of a large rounded mass occupying the lower two-thirds of the kidney from which projects the upper pole. The latter preserves its normal outline. The surface of the tumor is markedly nodular, the nodules varying greatly in size and projecting considerably above the surface of the tumor. At no point has the tumor broken through its proper capsule. The mass is soft, almost semi-fluctuant in the fresh state.

On section one sees the greater portion of the mass is made of a new growth, soft and cellular, of a yellowish color, and sharply defined from the remnant of the normal kidney substance at the upper pole. There are darker areas here and there due to hemorrhage. There are no cavities. The outer margin of the growth is not regular, but crescentic as though made up of a fusion of contiguous rounded nodular masses. Sections from different parts of the specimen, as seen in Plate XII, were taken for histological examination by Dr. J. S. Neate, of the Army Medical Museum, who reports as follows:

Three pieces were removed for examination, one from the periphery of the new growth, one from the necrotic center and one from the kidney substance proper. The tumor is sharply circumscribed by a capsule formed by the condensation of the kidney substance. Examination of the essential cells at once stamps it as a hypernephroma. These cells, roughly simulating those of the adrenal cortex, are large, clear, polygonal or very irregular in shape, with relatively a large amount of protoplasm, frequently

containing fat droplets or vacuoles. They present a columnar or alveolar arrangement and are supported by delicate strands of connective tissue containing numerous capillaries. These often appear to be in direct contact with the tumor cells. On leaving the periphery of the new growth the arrangement and character of the cells bcomes more irregular and atypical. In the same section and also the same field the transition from polygonal cells with columnar arrangement to rounder cells with alveolar formation, and finally to that of a diffused sarcomatous growth composed of spindle cells, is clearly shown.

Toward the center of the growth numerous hemorrhages have occurred and the whole central portion of the tumor consists of a necrotic mass of indifferently staining fibrin, pigment, crystals, and cell debris.

The section taken from the kidney tissue outside the limits of the neoplasm exhibits some degenerative change, but less than might have been expected. The glomeruli are conspicuous and Bowman's capsules are somewhat thickened. Polynuclear leucocytes are rather numerous in the blood vessels, but connective tissue increase is inconsiderable. The most marked change is found in the secreting cells of the tubules which are swollen and cloudy. They appear much distended by large, clear vacuoles situated at their free borders which project into and obstruct the lumina, giving in places a spider-web appearance of thin strands stretching from wall to wall. The nuclei are, for the most part, intact, stain well, and there is little or no disintegration or desquamation. This regressive change is interpreted as a hydropic rather than a fatty degeneration. The atypical structure of the tumor and the transition of cells from the adrenal to the sarcomatous type emphasizes its malignancy, and it is possible that metastases, if they have occurred, will prove to be of a sarcomatous nature.

Symptomatology. A small tumor may be present in the kidney for years without producing any symptoms whatever, and may be discovered accidentally at autopsy. On the other hand such a tumor, after existing for years as an apparently benign

growth, may suddenly show unmistakable signs of malignancy, increasing rapidly in volume, and producing metastases.

The three cardinal symptoms of renal new growth are: Tumor, pain, and hematuria. Unquestionably the most important of these is hematuria. This symptom, when present, is of great value from the standpoint of differential diagnosis, especially when it occurs early. That hematuria occurs at some time in the course of the disease in the majority of cases seems to be true, but the statistics given by different writers differ widely, varying from 5% to 90%. In the series of 28 cases reported by Albrecht it occurred 11 times, or 39.3%. It was the first symptom in only six cases, or 21.4%. In Israel's series of 66 cases of malignant disease of the kidney hematuria was present in 92.1%. Küster gives a percentage of 52 in 379 cases of malignant disease. Albarran and Imbert found hematuria in 66% of their adult cases, while Paul Wagner states, that in 80% of cases of hypernephroma this symptom is observed. It probably occurs less abundantly in hypernephroma than in other forms of renal tumor. The amount of blood lost varies much in different cases, and at different times in the same case. Cases have been reported in which the bleeding was so profuse as to fill the bladder with clots, necessitating a suprapubic cystotomy. It is usually spontaneous, but may follow injury, or even vigorous palpation.

There is one striking peculiarity about the hemorrhage in hypernephroma, the interval between attacks is often prolonged. Several years may elapse between the initial attack and a recurrence. Intervals of five, six and eight years have been reported. In our case there was an interval of three years between the last attack and the operation; it occurred only twice and then lasted for two urinations only. The first attack occurred five years before the patient came under observation. During the interval between attacks the urine is frequently free from microscopic traces of blood, and otherwise shows nothing abnormal.

Just why hemorrhage in hypernephroma is less frequent than in other forms of renal new growth is not clear. Indeed

we do not know what are the underlying conditions which favor hemorrhage in tumors of the kidney. It is possible, as suggested by Albrecht, that in hypernephroma the slow growth of the tumor and the thick capsule surrounding it may, in part, be the explanation. That the hemorrhage in many cases is independent of the invasion of the pelvis by the growth is proven by numerous observations where there was no hematuria although the growth extended directly into the pelvis. Furthermore, profuse hemorrhage has been noted in several cases where examination has shown the pelvis to be entirely free from invasion.

Pain. Local pain is a symptom of considerable diagnostic value, particularly in those cases where a tumor is not palpable. Pain in the region of the kidney, coming on spontaneously and independent of hematuria, was observed in 41.6% of the cases reported by Albrecht. It has been noted less frequently by other writers. According to the hypothesis of Israel, this symptom depends upon a sudden increase of pressure within an organ surrounded by an unyielding capsule, and may follow an acute congestion or hemorrhage into the substance of the tumor itself. Local pain is an early symptom, occurring in many cases several years before other symptoms manifest themselves. The pain may be referred to the lower extremities or to the testicle.

Tumor. A palpable tumor has been reported in the majority of cases, about 80%. This may be the only evidence of the trouble. On the other hand, it may be absent, even where widespread metastases have occurred. This is more likely to be the case where the growth involves the upper pole of the kidney, and is tucked up high under the ribs. Cases have been reported where a bone metastasis has been operated upon for the primary growth and examination revealed its true nature, but repeated examination failed to palpate a tumor of the kidney. Its presence, however, was demonstrated later by section. Such observations emphasize the difficulty sometimes experienced in palpating tumors of the kidney, even of considerable size.

Cachexia is a late symptom in hypernephroma, and not of

much value except in a negative way. In any case of renal tumor which has existed for a year or more and shows no sign of cachexia, the growth is probably a hypernephroma.

Symptoms referable to the gastro-intestinal tract are by no means uncommon. These were prominent in our own case. They probably result from pressure upon the stomach or bowel, either by the tumor itself, or by lymph gland metastasis. In some cases these symptoms are so prominent as to make the diagnosis extremely difficult, particularly where symptoms referable to the kidney are absent. There may be digestive disturbances, loss of appetite, soreness and tenderness in the abdomen, belching, vomiting, and pain in the region of the stomach with disturbance in bowel movements.

Another symptom of kidney tumor to which attention was first called by Guyon is the development of a varicocele on the corresponding side. This is not present in a large number of cases, but when present is very suggestive. Symptomatic varicocele associated with renal tumor does not disappear on lying down, and may thus readily be distinguished from the idiopathic form. It is probably due to pressure in the region of the spermatic or renal veins, or inferior cava. In our case there was distinct enlargement of the veins of the right scrotum. Similarly dilatation of the veins of the abdomen with the formation of a "caput medusæ" has been observed.

Diagnosis. In malignant disease of the kidney as elsewhere, the great desideratum is the early recognition of the condition, for the reason that the earlier the diagnosis is made and the growth removed, the greater are the chances of cure. But these cases offer peculiar difficulties to an early diagnosis. The older methods of examination depend for their success upon the recognition of changes which, in themselves, are indicative of a well-advanced lesion. The presence of a palpable tumor can be made out, if at all, only at a time when the disease has existed for a considerable period. In the absence of a tumor, particularly in those cases without hematuria, a diagnosis is not only extremely difficult, but impossible.

The results of the newer methods for determining the functional capacity of the kidneys as applied to cases of renal tumor have not been very encouraging. In our own case the examination of the separate urines, together with the indigo carmine test did not throw much light on the condition. The phloridzin test, as employed by Kapsammer, has seemed to be of real value. But after exhausting all our means of examination, there will remain a certain number of cases in which it is impossible to say whether or not a tumor is present. In such cases, the only course left is an exploratory operation. This course is approved by both Küster and Eiselsberg.

The clinical diagnosis can be made in a certain number of cases between the various forms of new growth, where a tumor can be definitely made out. The embryonic mixed tumors occur, with few exceptions, in children. A voluminous tumor speaks against carcinoma. The latter invades the surrounding tissues early, and the tumor becomes fixed. Cachexia occurs early. There is greater difficulty in distinguishing between sarcoma and hypernephroma. The last is slower in development, hematuria is less frequent and less abundant, and is often quite characteristic. Sarcoma is rare, while hypernephroma is the most frequent form observed.

Treatment. Complete removal as early as possible gives the only hope of cure. Partial nephrectomy or enucleation of the tumor is not to be considered, for reasons which are apparent.

The method of approaching the kidney will depend upon the individual operator. It would seem, however, that, in general, the extraperitoneal operation is preferable. Some operators prefer the transperitoneal operation on account of the better exposure, and the ease with which the vessels may be ligated before disturbing the tumor. In very large growths this route is undoubtedly advantageous.

In certain cases it will tax the best surgical judgment to decide whether or not any operation is advisable. Where widespread metastasis has occurred any operative interference is out of the question. But it is to be borne in mind that often only a

single metastasis occurs, for example a bone metastasis. In such, the advisability of removing the metastatic growth along with the primary tumor is to be considered.

One would suppose that in those cases where the renal vein has been invaded by the growth, little is to be expected from a nephrectomy, no matter how thoroughly done. Yet it is astonishing that several such cases have been reported well and free from metastases several years after operation. Such observations are interesting and important to bear in mind when considering the advisability of performing a nephrectomy.

Prognosis. When one considers the end results in those cases which have been followed several years, it must be admitted the prognosis in any case is bad. Local recurrence and late metastases are always to be feared. It is this tendency to late metastasis, sometimes many years after the removal of a primary growth, which makes the prospect of ultimate cure so hopeless. It is due to this peculiar characteristic of hypernephroma that some writers consider it the most malignant variety of kidney tumor.

Metastases. Metastases have been observed in practically every tissue of the body. Bone metastasis is frequently seen. Interesting cases have been reported by Scudder, Grosheintz, Albrecht and others. Such a metastatic growth may be the first evidence of the disease.

Metastasis takes place, in the majority of cases, by way of the blood stream. Extension of the growth into the renal vein and the inferior cava has been frequently seen. Exceptionally, extension has occurred through the lymphatics. According to Albrecht, hypernephroma, as distinguished from all other malignant tumors, exhibits the pecularity of forming a single metastasis through the blood stream.

Another peculiarity is late local recurrence and late metastasis after operation. Intervals of several years after operation before metastasis occurs is not uncommon. Clairmont records a case from v. Eiselsbergs clinic of a nephrectomy which was followed ten years afterwards by a recurrence in a bronchial lymph

gland. The case of Krönlein is most remarkable in which local recurrence followed a nephrectomy after an interval of eleven years.

Generally, metastasis occurs late in the disease when the tumor has reached a large size, has broken through its capsule, and is fixed. On the other hand, small growths may give rise to general metastases. These metastatic growths present, in certain cases, no peculiarity in histologic structure, and are similar to the primary tumor. At times the growth presents such a complex structure, such a variety in the type of cells, that, in the absence of any predominant cell-type, its true nature is extremely difficult to recognize, and it may be mistaken for some other form of primary tumor. Numerous cases of this kind have been reported. The hypernephroma of the iris and ciliary body so carefully and thoroughly studied by Chance, and reported in the *Journal of the Am. Med. Assn.*, February 9, 1907, is a striking example of this kind.

Time does not permit a further consideration of the pathology of hypernephroma. So far no satisfactory classification has been suggested despite the great amount of valuable work that has been done by the pathologists. Objections are urged against classifying these tumors with either the sarcomata or the carcinomata. It seems not unlikely that we have here a type of new growth, differing so widely from both of these as to justify us in considering it quite a distinct type. Until further work in this interesting field shall have cleared away the existing confusion, we can do no better than retain for these tumors the designation "Hypernephroma," which, after all, is only a clinical term.

DISCUSSION

Dr. F. Tilden Brown of New York. I am sorry that neither of the readers of the papers referred to the matter of prognosis in this disease. A paper read about a year and a half ago by Dr. Burke showed what was to me a very surprising finding. In reviewing the histories in the hospitals for many years it was found that these tumors were designated by special names given them by the pathologists from the histological ex-

amination of the cases. From the history of these cases he recognized a good many as cases of hypernephroma. In thirty-four cases he found that only one was living at the present time. This was quite at variance with my own experience, and what I know to be the experience of others, because I have seen surgeons operate on patients who are now living, and who have lived for a number of years since operation.

Another point is the recognized frequency of these tumors. Although they are of embryonic origin, their symptoms come on about middle life or after. I had one such case in a young man of twenty-one, a college student, where the diagnosis was made on the hematuria, the absence of X-ray evidences, totally negative evidence given by the examination of urine. cultural, microscopical and chemical, except for the presence of red cells. There was no appreciable tenderness of the kidney, but this common symptom of hematuria, was in this case, strikingly at variance with that given in the case just reported. It was constant for two years, day and night. That was also the feature in another case of mine which died of anemia. The diagnosis in this young man's case was confirmed by finding a hypernephroma of a globular shape in the margin of the kidney, which I was able to shell out. On account of the pathology of the condition, there being a pathologist present at the operation, we all agreed, in view of the ultimate tendency to malignancy of these growths, that a nephrectomy was preferable to closing the wound in the kidney, which, in this case, would have been easier because the tumor was somewhat encapsulated.

The cause of the hemorrhage in this condition is extremely interesting, and I think, as the first reader says, the remarkable fact of the almost totally destroyed organ being able to functionate almost on a par with the whole and normal organ on the other side, is most interesting.

A CASE OF CONGENITAL ABSENCE OF ONE KIDNEY

By F. R. HAGNER, M. D., of Washington, D. C.

MRS. H. 40 years of age, was referred to me by Dr. Gerry Morgan, on October 27, 1907.

Family History was negative, save that a sister died from pulmonary tuberculosis.

Previous History. Patient, in 1901, had excruciating pain extending to the groin of the left side. This was followed by the

passage of 53 stones via urethra. There was no blood passed at this time. For the succeeding two years she was practically free from symptoms, then she began to have attacks of pain similar to those experienced at the time the calculi were passed. However no calculi were passed nor have any been passed since those referred to five years ago. Patient suffered from diarrhœa for thirty years, occasionally she had from eight to twelve evacuations daily; she was the mother of two children, the first labor was instrumental, the second was normal; there were no uremic symptoms either time. She had leucorrhea intermittingly. In 1904 an ovary was removed, it was reported to me for an inflammatory condition.

About March 4, 1907, these attacks of renal colic began to be more frequent; following each, large quantities of pus appeared in the urine, but no calculi were passed. In June, 1907, she experienced the most severe attack of pain, sharp, shooting and knife-like in character, which lasted for twenty-four hours, although the patient was given three grains of morphia. The attacks increased in frequency and severity. Just prior to her visit to me she suffered also from inability to void urine and on catheterization no urine was obtained. The first urine passed after these attacks referred to was very cloudy, urination occurred at intervals of 15 to 30 minutes, was accompanied by marked burning, but with no sudden stoppage of the stream. Every micturition was more or less painful and the patient was up from three to eight times nightly to urinate.

On physical examination she was found to be a very stout woman weighing about 225 pounds, anæmic and had every appearance of illness. On abdominal palpation she was so fleshy and so nervous that nothing could be learned.

The examination of the urine showed a large amount of pus, a specific gravity of 1016, an acid reaction, a slight amount of albumin and 322 grains of urea in 24 hours. On Oct. 29, the patient was examined under ether at Garfield Hospital. The left kidney was palpable appearing enlarged, it was felt with difficulty as the patient was so very stout. (Right kidney was not palpa-

ble). She was then cystoscoped. The trigone was inflamed but the rest of the bladder was practically normal. The left ureteral orifice was seen, appearing gaping and discharging turbid urine. It was impossible to find the right ureteral orifice. The left ureter was then catheterized and urine identical with that obtained from the bladder collected. On microscopic and chemical examination there was practically no difference in these urines. A very careful search of the bladder was made but the right ureteral orifice could not be found. I had made such a careful search that I was sure only one ureter was present. An X-ray was negative for stone. I thought she only had one kidney at the time. Under large doses of urotropin and water the condition improved, at least the patient thought she was more comfortable. About the end of April she had repeated attacks of pain as described before and I felt that possibly opening and draining the pus from the kidney might prolong her life or at least make her more comfortable. Before operating I thought it best to make one more attempt to locate the other ureter, so she was cystoscoped again on May 14. The left ureter was catheterized and the collected urine showed an analysis identical to that obtained on Oct. 29. Very careful search revealed no other ureteral opening.

The patient was operated upon on May 19, 1908. The kidney was exposed, incised and about a pint of urine containing pus both free and inspissated escaped. No calculi were found. Drainage was maintained by fixing a tube in the pelvis of the kidney. The firm masses of purulent material passing down the ureter had unquestionably caused the severe attacks of renal colic. After the operation practically all urine escaped into the dressings. Several bladder catheterizations obtained only a few drops of urine.

The patient did very well for three days; she then began to vimit large amounts of fluid. A diagnosis of gastro-mesenteric-ileus was made. Secretion of urine continued up to the time of patient's death, nine days after operation.

Autopsy on May 28 revealed the presence of but one kidney.

On the right side there was no artery or rudimentary vessel in the location of the renal artery. Careful search was made for an adrenal gland but none could be found. The large pyonephrotic kidney was removed from the left side together with the bladder. Careful examination of the bladder revealed but one ureteral opening, namely the left.

Without cystoscopic examination and ureteral catheterization, I believe this kidney would have been removed. Although the result to the patient could have been no worse than in this case, it is certainly more satisfactory to have made a correct diagnosis, than to have removed a solitary kidney.

DISCUSSION

Dr. Paul Thorndike of Boston. I have had the misfortune to remove a solitary kidney under the following circumstances. I do not know how often these single kidneys occur. It must be with some frequency. In the case to which I refer and about which I wish to make mention, the patient was a middle-aged man, a stevedore, working hard with his muscles, supposedly in excellent condition, and, other things being equal, supposably with two good kidneys. He fell through the hatchway of a ship and burst his right kidney. While it is my belief that such cases of rupture of the kidney frequently take care of themselves without operation, and while I think I am rather conservative than otherwise in operating, in this instance there was no question. The man was bleeding into his peritoneal cavity, into the bladder and into his loin. He was dying of hemorrhage. I hadn't time to do anything but a nephrectomy, and I did it. The man lived for three days with anuria, and died at the end of that time. At a partial autopsy it was definitely determined that there was no left kidney. The kidney was smashed to pieces, and it was very difficult to get an idea as to its size and shape before the accident. All I could say is that it was larger than normal.

I should like to ask Dr. Hagner if he has any idea how frequently these single kidneys occur.

Dr. Hagner. I do not know.

Dr. L. Bolton Bangs of New York. At the last Triennial Congress in Washington, Prof. Huntington, Professor of Anatomy at the College of Physicians and Surgeons in New York, presented a series of abnor-

malities of the kidney, and showed that there was a large proportion of cases with one kidney. He showed how the ureters were duplicated, and how a mistake might easily be made.

Dr. H. A. Fowler of Washington, D. C. I just rise to report a case of this kind which I came across in looking up the literature of hypernephroma. I found that Stein had had under observation seventeen cases of renal tumor, in four of which he operated, and he tells us that in one of his cases the reason that operation was not carried out was the congenital absence of the kidney on one side.

Dr. Louis E. Schmidt of Chicago. In connection with this case it is interesting to mention the rudimentary kidney. The past year several instances have been reported—one by Dr. Eisendrath of Chicago. He showed the post-mortem specimen. The one kidney was infected and numerous stones were present. If a nephrectomy had been done on this side—death would certainly have followed.

Dr. Hagner in closing. I believe that these cases with double ureters and solitary kidneys are usually horseshoe kidneys and not the so-called solitary kidneys. I have seen one case of rudimentary kidney. The patient died of some intercurrent disease, and I simply saw it at autopsy.

FUNCTIONAL DIAGNOSIS OF RENAL DISEASE, ESPECIALLY BY EXPERIMENTAL POLYURIA.

By E. L. Keyes, Jr., M. D., of New York.

THE tests of renal function are of two chief varieties. The tests without ureter catheterism and those with ureter catheterism. Among the former we may include all the old-fashioned tests of renal function: physical examination of the patient, investigation of his history and urinalysis of 24 hour specimens, and night and day specimens, especially with reference to crystals, pus, tubercle bacilli, etc.

In the second class are the tests commonly spoken of as renal functional tests, and requiring catheterism of the ureter, or intravesical separation of the urine. These again may be divided into three classes.

(1) Routine analysis of the specimens obtained with special reference to quantity, quality, (as indicated by urea, total nitro-

gen or freezing point) and microscopic examination of centrifuged sediment.

(2) Elimination of substances artificially introduced into the circulation (methylene blue, phloridzin and indigo carmin).

(3) Experimental polyuria.

Of these three types of examination, the first is implied whenever the ureter catheter is employed. The question which arises is, whether we obtain any greater degree of accuracy by employing artificial elimination tests and experimental polyuria or not? To answer this question as far as I can is the object of this contribution. My investigations have borne chiefly on experimental polyuria.

Artificial Elimination. For artificial elimination I have chiefly used phloridzin, injecting 1 c. c. of a 1% solution in 33% alcohol. In a few cases I have injected 3 or 4 c. c., of a 10% solution indigo carmin, and since the indigo comes through the kidneys with apparently the same regularity as does the phloridzin, it seems preferable, since it requires no chemical analysis whatever and, therefore, does not waste the urine or introduce any element of confusion in quantitative analysis.

That phloridzin demonstrates, as Kapsammer and others allege, the precise functional activity of the renal epithelium more accurately than any other substance artificially eliminated, may be theoretically true, but does not appear in practice. I have found it totally misleading if taken as an absolute criterion. I have had the experience of other surgeons in performing successful nephrectomy for tuberculosis of the kidney upon a patient in whose combined urines phloridzin did not appear for two hours. I have noted total absence of phloridzin for an hour and a half in a patient both of whose kidneys seemed entirely normal. (Chart II). I have noted in another tubercular patient that while 2 c. c., of 1% injected phloridzin appeared in the total urine in two and a half hours, 1 c. c. appeared only in four hours; and yet operation revealed that one of this patient's kidneys was in fair condition. On the other hand, in Dr. Watson's case (Chart III) the right kidney gave glycosuria in 14 minutes and

the left in 17. This was a most astounding showing with so manifest a debility of the left kidney.

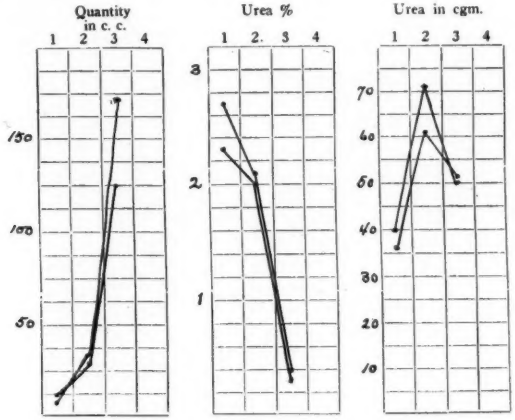
In other words, the elimination tests are not a precise indication of the anatomical condition of a kidney. But in comparing the two kidneys to each other, these tests are sometimes of the greatest value. That one kidney shows phloridzin glycosuria in 15 minutes, while its fellow shows it only after 30 or 45 minutes, does not mean either that one kidney is perfectly sound or that its fellow is utterly diseased; it simply means that the kidney that first excretes phloridzin sugar is in better condition than the one that excretes it later: how much better must be determined by other tests.

*Experimental Polyuria.** This method, which was introduced into urologic practice by Albarran, consists in taking a patient who has not eaten anything for at least four hours, or drunk anything for at least three hours, catheterizing the ureters and collecting the urine as follows: That passed during the first ten minutes is collected for microscopic analysis; thereafter the urines are collected by half hours. At the end of the first half hour Albarran administers two or three glasses of Evian water. He then collects separate specimens of urine for three consecutive half hours thereafter. Comparing these eight specimens among themselves he finds that by taking the quantity and quality (urea, nitrogen, freezing point) as a norm, during the second half hour (i. e., immediately after the water has been drunk) the quantity of urine excreted by the normal kidney rises markedly, and this rise continues, or holds its own during the two succeeding half hours, or begins to fall off during the fourth. At the same time the quality of the urine deteriorates (urea percentage and the Δ), this fall being of course proportionate to the intensity of the polyuria, while the actual work done by the kidney, whether measured by centigrams of urea or by Δ volume, may increase or decrease. Plotting this out on charts he gets curves similar to those shown on Chart I. If both kidneys are normal their curves

* These observations are founded upon thirty examinations. Some five or six of the cases were catheterized for me by Dr. B. S. Barringer.

PLATE XIII.—Presented by Dr. E. L. Keyes, Jr.

Number I. Age ..... Diagnosis .....



At the end of 1st period drank 2... glasses of water. and 15 c c of whiskey

Catheter in both ureters

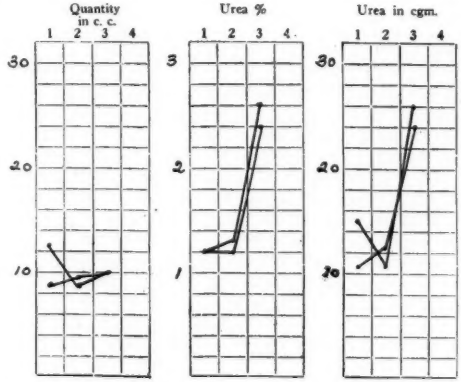
Extra catheter flow No..

Microscopic Right Negative

" Left ..... " "

X-ray negative

Number II. Age ..... Diagnosis .....



At the end of 1st period drank 4... glasses of water.

Catheter in T... ureter. 7

Extra catheter flow No..

Microscopic Right (Bladder)

" Left Negative

Phloridzin Right Not in 1½ hrs

" Left No...

Albumin Right .....

" Left .....

X-ray showed pelvic shadows which stylettes catheters proved extra ureteral

may be expected to run approximately parallel, although if the same two kidneys are examined at a subsequent period their parallel curves may be entirely different.

As an uncommon variant note Chart II. This chart was taken from a patient who suffered from abdominal pains and a very slight retention cystitis. Radiography showed pelvic shadows that were proven extra-urethral by the stiletted catheter; and a few washes of nitrate of silver cured the cystitis. The urine obtained from the kidneys was normal, yet we note that in this case the experimental polyuria showed itself not by increase in quantity, but by increase in quality. The quantity remained the same; the urea percentage and the urea in centigrams shot up. In another case, almost the same in its physical characteristics, both the quantity and urea percentage increased (Case 1).

We should run counter to physiologic fact in attributing this increase in urea percentage to the administration of water. On the contrary, this phenomenon simply shows that enough water was not administered to excite polyuria. The increase in urea was accidental.

Yet, in a sense this urea variation is not accidental. Guyon and Albarran long ago showed that the gravely diseased kidney has a practically constant output of urea and of water during the 24 hours, while the output of solids and fluid from the normal kidney constantly varies. It shows its functional capacity, its reserve force, as Barringer aptly terms it, by constantly varying its output in accord with the constantly varying physiologic requirements, while the gravely diseased kidney is working under pressure and at top speed, as it were, all the time. This observation gave the suggestion from which Albarran subsequently developed the experimental polyuria test.

But in my experience it has been almost impossible to gauge the amount of water necessary to ensure polyuria. I have employed only tap water, seconded in some instances by whiskey. I find that:

(1) Many patients refuse to drink more than three glasses of water in fifteen minutes.

(2) Though this amount is quite sufficient in some instances, notably in neurotic subjects, to excite intense polyuria,

(3) In others, even the addition of whiskey may fail to produce polyuria within an hour.

(4) Therefore, it is my custom to encourage the patient to drink at least three glasses of water, more if possible.

Thus, at the very outset, in experimenting upon normal cases we are met with a difficulty of which Albarran's classical charts give us no warning, and at first sight this difficulty seems grave enough to shatter the whole fabric. Indeed, the investigators who have endeavored to verify Albarran's results have all felt the force of this objection and have very generally made it their excuse for rejecting the test.

But in spite of the fact that the "experimental polyuria" test may not succeed in exciting polyuria, it has distinct value. For even without experimental polyuria, the output of the normal kidney varies from one-half hour to another (Chart III), and may thereby be distinguished from its diseased fellow, which shows a slighter variation. A successful experimental polyuria simply enhances this natural discrepancy. If the discrepancy is naturally great, no enhancement may be required; but if the discrepancy is slight, every effort should be made to induce the patient to take at least four glasses of water and a drink of whiskey during the second half-hour of the examination. Moreover, it is in just these doubtful cases that the four full half-hours,* which may otherwise be cut down to three, are required.

Yet, since there always remains a doubt in one's mind whether the experimental polyuria is actually at work, we require some criterion of this fact. Such a criterion we possess in marked and progressive urinary dilution. When, as in Case 4 and Charts I and III, the percentage of urea falls markedly during the third half-hour, one recognizes that the experiment is working, while if, as in cases 1, 2, 3 and 5 and Chart II, the percentage of urea varies but little or actually rises, one must consider

* In some hypersensitive patients it has seemed wise to shorten the periods to 20 minutes each.

the polyuria at least relatively ineffectual and study the results as representing a series of ureter catheter observations.

General pathological conditions may gravely upset an experimental polyuria test. One case, septic, catheterized while the temperature stood at 102-4° F., showed, when charted, a totally eccentric curve (Case 2). But the constantly high percentage of urea attested the integrity of the two kidneys, and whether the test failed by faulty technique or as a result of toxemia makes no difference in the conclusions drawn.

Similar conditions are illustrated in two other cases both with gravely tubercular kidneys and bladders so diseased as to prohibit cystoscopy;* both had nocturnal polyuria. Radiography apparently demonstrated a gravely diseased kidney in each instance. In order to make some test of the functional capacity of the healthy kidney, phloridzin was injected (and its appearance delayed more than an hour in each instance) and experimental polyuria performed both in the morning and at midday.

The good curves obtained from the midday experiment were justified in one case by successful nephrectomy; in the other by the discovery of a kidney only slightly hydronephrotic (the radiograph having been misleading). Yet in each instance the pathologic nocturnal polyuria overshadowed the experimental polyuria.

From these observations, I would submit the following conclusions in reference to the normal kidney:

(1) Experimental polyuria usually increases the quantity and dilutes the urea in the urine of the normal kidney; the work actually done usually increases.

(2) In some instances, however, the quantity does not increase, while the urea percentage does.

(3) In the presence of certain marked pathologic influences (grave toxemia, nocturnal polyuria) the effect of the general condition upon the normal kidneys may be such as to more than counterbalance the natural effect of the experimental polyuria.

* One was so sensitive he would not permit cystoscopy under any conditions; the other had a tubercular bladder and a large tubercular abscess in the prostate.

(4) It is quite probable that even a considerable pathologic stimulation might be overcome by an excessive experimental stimulation and therefore, in some cases, the patient should drink more than three glasses of water, or should add whiskey to the water.

(5) The efficiency of the polyuria may be estimated by the fall in urea percentage, especially during the third half-hour.

(6) If the test fails to excite polyuria, it is nevertheless, valuable as affording several observations on the comparative functional activity of the kidney.

(7) Variations in quantity and quality in the absence of polyuria are suggestive of good functional activity.

The Diseased Kidney. When one kidney is normal and the other markedly diseased, experimental polyuria gives very striking results, as exemplified in Chart III, taken from a case of Dr. Watson's, from whom almost the whole of one kidney had been removed, the remaining fragment being greatly infected and probably insignificant in size.

The normal kidney presents the familiar curve, while the diseased one presents three striking differences:

(1) The quantity and quality of urine excreted by the diseased kidney are markedly inferior to those of the urine excreted by the healthy kidney.

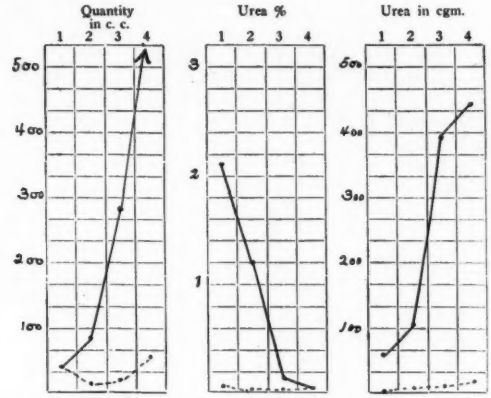
(2) The curve of the diseased kidney is less abrupt than that of the normal kidney; it may even fall instead of rising, and the impairment in kidney function is generally proportionate to the flatness of the curve.

(3) The disparity between the curve of the healthy and the diseased kidney is proportionate to the amount of artificial stimulation. Compare the curve in Chart I, excited by two glasses of water and a half ounce of whiskey, with the absence of polyuria shown on Chart II, after four glasses of water, while the most striking polyuria of all, shown in Chart III, is where the patient drank seven glasses of water.

Both Kidneys Gravely Infected. Chart IV is from a patient whose life was saved six months before by a Chetwood op-

PLATE XIV.—Presented by Dr. E. L. Keyes, Jr.

Number III. Age ..... Diagnosis .....



At the end of 2d period drank ..7.. glasses of water.

~~Catheter in ..... ureter.~~

~~Extra catheter flow .....~~

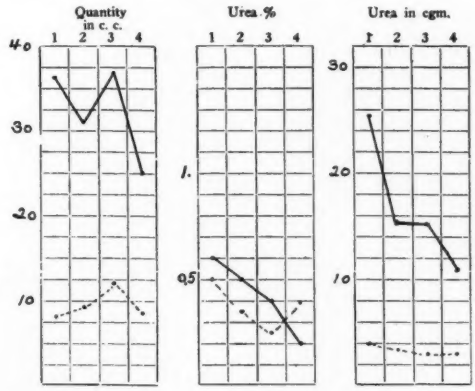
Microscopic Right Pus. Blood Uvrates

Left .....

Phloridzin Right 14 minutes

" Left 17 " " "

Number IV. Age ..... Diagnosis .....



At the end of 1st period drank 3... glasses of water

Catheter in Rt... ureter.

Extra catheter flow N.o.

Microscopic Right Pus.

" Left Bladder

Golf hole rt ureter

Phloridzin Right None in 6 hrs

" Left ..... " " "

eration done under local anesthesia. He had complete prostatic retention for ten years, and a prostatic abscess at the time of operation; his condition was so grave that general anesthesia was deemed impracticable. Recovery from operation was complete. The retention had been relieved, but the suppuration in his kidneys of course, continued. This chart shows a right kidney doing very little work, as shown by the urea in centigrams, and by the relative straightness of its line of excretion as compared with the left kidney; but even the left kidney is gravely impaired, as suggested by the fact that it responds but lightly to the polyuria. Phloridzin glycosuria in this case was delayed for six hours, and the argyrol injection test showed marked dilatation of the pelves.

Slight Renal Impairment. When one or both kidneys are but slightly damaged by retention or suppuration, or when the difference between the condition of the two kidneys is not great, the experimental polyuria test, like every other test of renal function, is put to its severest trial to distinguish the precise conditions present.

Chart V illustrates such a condition. In this case, there were aseptic oxalate calculi in the left renal pelvis which I subsequently removed successfully. This chart shows a marked polyuria of the diseased side throughout the test, and only a slight average deficiency. Operation revealed a kidney normal to all appearances, and a pelvis only slightly thickened. Stones were removed by pyelotomy. It is my impression that if this patient had drunk more than three glasses of water, or added a glass of wine or whiskey, the polyuria induced in the normal kidney might have overcome the pathological polyuria due to stone. This chart gives no precise indication of any abnormality in the kidneys; it is not nearly so abnormal as Chart III, for instance, yet, had the experimental polyuria not been performed, the considerable difference in quantity and urea volume might very well have led to the belief that the right kidney was more diseased than the calculous left one.

Chart VI is of peculiar practical interest. It shows deficient polyuria in the left kidney. This patient was brought to me as

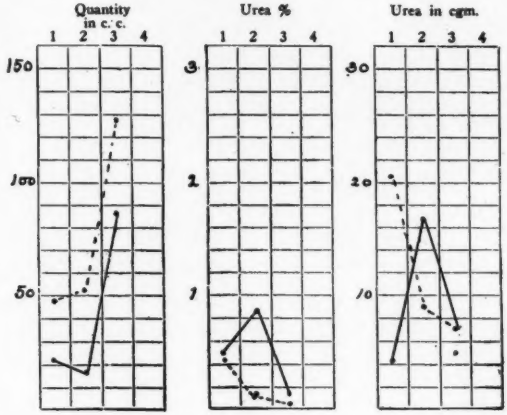
a case of albuminuria. Investigation revealed urethral stricture, which for twenty-five years had been insufficiently dilated, and the urine contained pus, bacteria, a little albumin, and a few casts. The patient was X-rayed several times, and every plate showed shadows of a supposed stone in the left ureter. A functional test was then made, showing deficiency of the left kidney. The inference so far was absolutely confirmatory of stone in the left ureter. The pelves of the kidneys were then injected with argyrol, and the patient again X-rayed,* showing that the suspected stone was outside the urinary tract, but that the left ureter was probably slighly adherent to the lower pole of the kidney. I have no doubt that the deficiency of the left kidney in this case was due to renal retention from adhesions about the pelvis.

Looking over these charts, I think you will agree with me that when one kidney is gravely diseased and the other practically normal, experimental polyuria may not be necessary to indicate the site of lesion, and this is especially true if the microscope shows abnormal constituents in the urine from one kidney and not from the other. On the other hand, if one kidney is but mildly diseased and the function about equally impaired on the two sides, experimental polyuria, as I have performed it, may not clearly indicate which side is the more diseased. I think, however, that in future the use of more water or of alcohol in addition to the water, will give me better results in this regard. Yet experimental polyuria is no more infallible than any other test of renal function. Its chief virtue is that it multiplies the observations of urine drawn from the two kidneys under varying conditions. We actually put the kidney through its paces and thereby get a much more definite idea, in the main, of what it can do than we could possibly get by any single observation. In doubtful cases, the artificial excretion tests are of value. Estimations of the urea percentage and urea in centigrams are, of course, eminently essential to the study of the precise function of the kidney; but the series of observations possible with experimental polyuria gives us a point of view that we cannot otherwise obtain.

* See Trans. Urolog. Assn., 1909.

PLATE XV.—Presented by Dr. E. L. Keyes, Jr.

Number V. Age ..... Diagnosis .....



At the end of 1st period drank 3 glasses of water.

Catheter in Both ureters

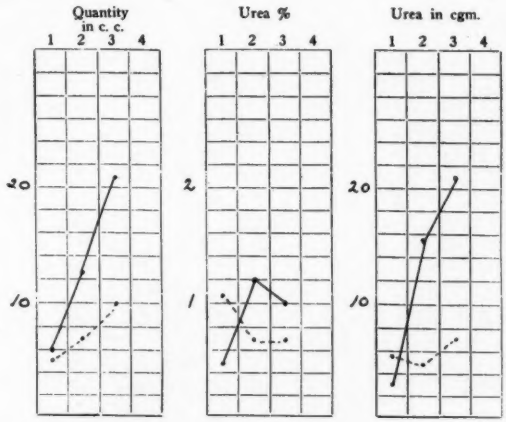
Extra catheter flow No.

Microscopic Right Negative

" Left " " "

X-ray shows Stones

Number VI. Age ..... Diagnosis .....



At the end of 1st period drank 3 glasses of water

Catheter in ~~Both~~ ureters

Extra catheter flow No.

Microscopic Right Bacteria ++ pus

" Left " " "

Functional Diagnosis of Renal Diseases. The following cases may serve to illustrate how misleading features in the urinalysis of specimens obtained during the first period are controlled by comparison of the urinalysis obtained at subsequent periods:

CASE 1. Male, 51 years of age, with slight prostatic retention, residual urine varying from 20 to 80 c. c., and vague, persistent pains in the left side. Experimental polyuria; three glasses of water administered at the end of the first half hour; no pus, bacteria or casts from either kidney.

		R.			L.	
		urea %	urea		urea %	urea
	c.c.		in cgm.	c.c.		in cgm.
1st half hour	25.5	1.3	33.15	15	1.15	17.25
2d half hour	33.	1.1	36.3	37.5	1.1	41.25
3d half hour	65.	2.25	146.25	55.	2.35	129.25

CASE 2. Male, aged 35; septic; no focus ascertainable; obscure abdominal pains. Experimental polyuria; three glasses of water administered after first half hour; both ureters catheterized; no pus, bacteria or casts from either kidney.

		R.			L.	
		urea %	urea		urea %	urea
	c.c.		in cgm.	c.c.		in cgm.
1st half hour	13.	3.5	45.5	Only a few drops.		
2d half hour	2.5	3	7.5	5	2.8	14
3d half hour	1.5	2.8	4.2	18	3	54

CASE 3. Female, aged 27; left renal colic; radiograph shows two stones in left renal pelvis. Experimental polyuria; three glasses of water administered after first half hour; no pus, bacteria or casts in either side; periods of twenty minutes.

		R.			L.	
		urea %	urea		urea %	urea
	c.c.		in cgm.	c.c.		in cgm.
1st period	21.	0.5	4.2	48.	0.425	20.4
2d period	18.5	0.9	16.65	53.	0.16	8.83
3d period	74.	0.1	7.4	129.	0.04	5.16

CASE 4. Male, aged 26 (Dr. Watson's case, Chart III). After injection of 1 c. c. of 1% phloridzin, sugar appears in four-

teen minutes from the right kidney, in seventeen minutes from the left. Experimental polyuria, periods of an hour. Drank seven glasses of water after the *second* half hour. Fourth period calculated from specimen collected in 12 minutes; pus and bacteria from both sides; renal epithelia profuse from left side, very few from right.

	R.			L.	
	c.c.	urea %	urea in cgm.	c.c.	urea %	urea in cgm.
1st period	44.	2.1	59.4	45.	0.4	1.8
2d period	88.	1.2	105.6	11.5	0.2	2.3
3d period	281.	0.15	394.5	23.	0.1	2.3
4th period	595.	0.075	446.25	55.	0.08	4.4

CASE 5. Female, aged 29; repeated right renal colics; intermittent tumor in right loin; right kidney movable; subsequent operation showed right infected hydronephrosis due to adhesions of the pelvis to the lower pole of the kidney. Experimental polyuria, with three glasses of water at the end of the first half hour; pus from right side only.

	R.			L.	
	c.c.	urea %	urea in cgm.	c.c.	urea %	urea in cgm.
1st period	2	1.5	3	6	1	6
2d period	0.5	0.5	0.25	7	1.5	10.5
3d period	2.5	0.4	1	11	1.25	13.75

DISCUSSION

DR. LOUIS SCHMIDT of Chicago. Although the whole subject of testing the sufficiency or insufficiency of the kidneys is still in doubt—that is, the value of it—yet the only way that we can come to any positive conclusions is by work of this character. I am inclined to believe that the large majority of surgeons throw aside what little value there is in connection with the sufficiency and insufficiency of the kidneys at the present time, for the simple reason that we are not working on any positive basis, and, as I say, work of this character will probably bring up the true value of the sufficiency or insufficiency at some future date.

DR. GEORGE K. SWINBURNE of New York. I only want to ask one question, and that is, how far does Dr. Keyes insert his catheter in this prolonged leaving of the catheter in the ureter?

DR. KEYES. Always fifteen centimeters, if I can get it up that far, and frequently twenty or twenty-five. I found very early that if you only inserted it five or ten it is very apt to be out before you get through, although Albarran inserts it only ten. I always use a " flute-end " catheter, with several openings.

DR. JOHN H. CUNNINGHAM JR., of Boston. I personally want to thank Dr. Keyes for bringing this important subject so clearly to our attention. There is one point that he has emphasized, which I think might be mentioned again—that is, the value of keeping the catheter in the ureter for such a long period of time and taking the urine at half-hour periods. I think we all realize that often after passing the ureter catheter the urine does not start to flow immediately, but in a short time we get that stimulus, whatever it is, eliminated, and then may really get an idea of what the kidney function is. The same test eliminates the nervousness which often excites a polyuria in a certain class of patients.

THE INFLUENCE OF THE OPERATION OF RESECTION OF THE KIDNEY UPON THE FUNCTION OF THE ORGAN. A. WHEN THE KIDNEY WOUND IS CLOSED BY SUTURES. B. WHEN THE KIDNEY WOUND IS DRAINED. (A) BY A RUBBER TUBE. (B) BY GAUZE.

(A PRELIMINARY REPORT OF EXPERIMENTAL WORK ON RABBITS. FROM THE LABORATORY OF SURGICAL RESEARCH, HARVARD MEDICAL SCHOOL.)

By DR. JOHN H. CUNNINGHAM, JR., of Boston.

THE experimental work which forms the basis of this communication was suggested by an operation upon a young lady with but a single kidney, which kidney contained calculi. The kidney was exposed in the lumbar region; split in Brödels line, and three calculi of medium size removed. Another calculus the size of a pea was also detected in the ureter at a point two inches from the pelvic outlet. This stone was worked upward into the kidney pelvis, the pelvis opened on the posterior surface and the stone removed. A ureteral sound was passed through the ureter to the bladder to establish its patency.

The incision in the pelvis was closed with fine silk. The wound in the kidney substance was closed without drainage with mattress sutures of catgut. The external wound was closed without drainage. The patient was catheterized immediately following the operation, and about 1 oz. of slightly bloody urine withdrawn. There was some fear entertained that the kidney might not secrete following the operation, and to determine this the patient was catheterized one hour after the operation, and every subsequent half hour. No urine could be obtained from the bladder by catheterization until eight and one-half hours after operation. At that time a little more than 1 drachm of slightly bloody urine was obtained. Catheterization one hour later showed a little less than 1 oz. of clear urine, and the catheterization one hour later (10½ hours after operation) showed a little over 1 oz. of an almost clear urine. From that time on, the amount of urine increased, and the patient voided a nearly normal colored urine in fair amounts, having no further diminution of activity of the kidney function.

The question which presents itself in connection with this operation and the accompanying temporary arrest of the kidney function is "Does a kidney which is subjected to an operation, temporarily cease functionating?"

All are familiar with the ideas regarding reflex anuria. The subject here under consideration is not the same, in as much as we are dealing with a single diseased kidney at the outset. It may be, however, that the arrest of the kidney function in the case referred to, finds its explanation in the same influences as reflex anuria, when one kidney is operated upon and the other diseased. Whether or not an operation upon one kidney while the other is healthy, results in a temporary arrest of the secretory power of the kidney operated upon is the point in question. It may be that an operation performed upon one kidney arrests its secretion temporarily, no evidence of the fact being demonstrable because of the unarrested secretory power of the untouched healthy kidney on the opposite side.

It being quite impossible to determine the arrest of the func-

tion in a kidney operated upon in the presence of another healthy kidney which continues to secrete urine following operation, it becomes necessary in experimental work that we should deal with animals possessed of but one kidney. The preliminary experimental work to determine this point consisted in,

STEP 1. The removal of the left kidneys of rabbits, measuring the size of the right kidney in order that its compensatory enlargement might be determined later; and noting the time following operation that the rabbit voided urine.

STEP 2. Subsequently operating upon the remaining right kidney, measuring its size to determine the vicarious enlargement of the organ; resecting a small portion of the kidney substance from its greater convexity, and splitting through the kidney substance to the pelvis. *A*. Closing the wound in a certain number with mattress sutures and noting the time following the operation that the rabbit voided urine. *B*. Performing the same operation in a certain number of rabbits and establishing drainage; *a*. with a rubber tube, and *b*. with gauze, not closing the kidney wound entirely and noting the time at which kidney secretion was again established. The technique employed in each rabbit was the same, and is as follows:

Technique. Step 1. The abdomen was opened through a median incision. The left kidney was exposed, freed from its bed, the pedicle clamped and tied with catgut and the kidney removed. The right kidney was exposed and measured by means of compasses without dislodging it from its bed; the measurements being the length of the organ from pole to pole, and the width from the junction of the pelvis and kidney substance to the midpoint of the greater convexity. The stomach was drawn into the wound, and injected with 25m. of a 10% aqueous solution of methylene blue by means of a hyperdermic syringe. The needle puncture in the stomach was inverted by a purse-string suture of linen thread. The abdominal wound was then closed, and the rabbits placed in a cage, the floor of which was covered with white blotting-paper so as to determine the presence of the first urine voided containing the methylene blue.

Table No. 1, showing the duration of time between the left nephrectomy and the first urination.

Rabbit No. 1	Died				
Rabbit No. 2	Urinated between	10	and	18	hours
Rabbit No. 3	Urinated between	10	and	18	hours
Rabbit No. 4	Urinated between	10	and	18	hours
Rabbit No. 5	Urinated between	10	and	18	hours
Rabbit No. 6	Urinated between	4	and	6	hours
Rabbit No. 7	Urinated between	1	and	4	hours (no blue)

Table No. 2, showing the duration of time between the resection of the remaining right kidney, closing the wound entirely, and the first urination.

Rabbit No. 1	Died				
Rabbit No. 2	Urinated between	38	and	43	hours
Rabbit No. 3	Urinated between	38	and	43	hours
Rabbit No. 4	Urinated between	38	and	43	hours
Rabbit No. 5	Urinated between	43	and	44	hours
Rabbit No. 6	Urinated between	38	and	43	hours
Rabbit No. 7	Died during the operation				

These two tables serve in comparison to show the time at which urination is established (a) when one of the two kidneys is removed (b) when an operation of kidney resection and closure of the wound is performed on a rabbit with but one kidney.

The rabbit normally urinates about every three hours. (a) When one of the two healthy kidneys was operated upon, urination was somewhat retarded. This may be due to reflex inhibition of the untouched kidney; more probable, however, it was the result of the ether. It was impossible to note the exact moment at which urination took place. In this class, however, urination was noted to take place before 18 hours in all rabbits, some earlier as may be seen by the table. (b) When the operation of resection of the only kidney present in the rabbit was performed and the wound closed entirely, the time at which urination was established was considerably longer. In none did urination take place for 38 hours, and in one it did not take place until after 43 hours.

It becomes evident from these experiments that an operation of kidney resection upon a healthy rabbit with but a single kidney, although that kidney is healthy and has undergone its maximum vicarious enlargement, does temporarily diminish the func-

tion of the organ as evidenced by the fact that urine ceases to be formed for many hours.

Table No. 3, showing the vicarious enlargement of the kidney after removal of left kidney.

Rabbit No. 1.—Died.
Rabbit No. 2.—Meas. 2.7 cm long x 1.9 cm from hilum to greater convexity.
Four days later.—Meas. 3.8 cm long x 2.6 cm from hilum to greater convexity.
Increase—1.1 cm in length and 0.7 cm in width.
Rabbit No. 3.—Meas. 2.2 cm long x 1.9 cm from hilum to greater convexity.
Four days later.—Meas. 3.2 cm long x 2.3 cm from hilum to greater convexity.
Increase—1.0 cm in length and 0.4 cm in width.
Rabbit No. 4.—Meas. 2.2 cm long x 1.9 cm from hilum to greater convexity.
Three days later.—Meas. 3.4 cm long x 2.4 cm from hilum to greater convexity.
Increase—1.2 cm in length and 0.7 cm in width.
Rabbit No. 5.—Meas. 2.3 cm long x 2.2 cm from hilum to greater convexity.
Three days later.—Meas. 3.9 cm long x 2.6 cm from hilum to greater convexity.
Increase—1.6 cm in length and 0.4 cm in width.
Rabbit No. 6—Meas. 3.1 cm long x 1.8 cm from hilum to greater convexity.
Three days later—Meas. 4.0 cm long x 3.0 cm from hilum to greater convexity.
Increase—0.9 cm in length and 1.2 in width.
Rabbit No. 7.—Meas. 2.4 cm long x 1.7 cm from hilum to greater convexity.
Three days later—Meas. 3.8 cm long x 2.9 cm from hilum to greater convexity.
Increase—1.4 cm in length and 1.2 in width.

Four of these rabbits had a period of three days and two a period of four days during which the kidney might increase in size to compensate for the left kidney which was removed. It appears that the kidneys left four days did not increase more than those left only three days. It may be infrerred from this datum that the vicarious enlargement of the rabbit's kidney reaches its full development before three days. Food and water was present in each cage.

STEP 2. Performed several days later. The abdomen was opened through the same median incision, the kidney exposed and measured as before. The kidney was freed from its bed. A wedge from the greater convexity measuring from 2 to 3 cm. long by about 1 cm. wide and from 1 to 1½ cm. deep was removed. A blunt instrument was passed into the pelvis in each instance. The wound in the kidney was closed, two mattress sutures of No. 00 catgut being placed through the substance of the kidney. The stomach was injected with methylene blue in the same manner as noted in Step. 1. The rabbits were placed in a cage, the floor of

which was covered with white blotting paper and the time of the first urination following operation noted.

It having been determined from these experiments that an animal possessed of a single kidney which kidney has a temporary arrest of its secretory function following an operation of resection of a portion of the organ and closing this wound entirely by sutures, information was desired whether or not the same arrest of the urinary secretion takes place when the kidney wound is not closed entirely but is drained.

To determine this point another series of animals was subjected to a left sided nephrectomy, the right side being left undisturbed, and subsequently undertaking the same operation of kidney resection as previously noted; but instead of closing the wound entirely, rubber tubing or gauze was carried into the renal pelvis and brought out through the loin, the kidney wound being but partially closed by a catgut suture on either side of the drainage. A clean pad was placed over the drainage and fastened in position so as to detect the first appearance of methylene blue in the pad. The animals were placed on white blotting paper to detect the urine if voided. The time at which the elimination of this fluid, which determined the times at which the kidney began secreting when (a.) rubber tube was used, and when (b.) gauze was used, are seen in the following tables.

Table No. 4 (a). Showing the duration of time between the operation and the first secretion of urine when the kidney was drained by a rubber tube.

Rabbit No. 1.—The pad on the drainage tube became moistened with a blue fluid between 6-7 hours following operation.

Rabbit No. 2.—The pad on the drainage tube became moistened with a blue fluid between 6½-7 hours following operation.

Rabbit No. 3.—The pad on the drainage tube became moistened with a blue fluid between 7-8 hours following operation.

Rabbit No. 4.—The pad on the drainage tube became moistened with a blue fluid between 7-8 hours following operation.

Rabbit No. 5.—The pad on the drainage tube became moistened with a blue fluid between 6½-7 hours following operation.

It was noted that the pads became stained with a blue fluid

before eight hours in each instance; before seven hours in the majority. No rabbit voided urine.

These animals were well 48 hours after the operation. They were killed by the injections of strychnine. The autopsies showed that the kidney incisions approximated by the suture at either side of the tube were firmly adherent. The kidney substance appeared normal with no evidence of blue stains. There was slight hemorrhage in the kidney tissue for a depth of 1-3 cm. around the tube. There was no blood clot in the kidney pelvis, ureter or bladder. Rabbits No. 1 and 4 had a small amount of normal colored urine in the bladder. In each of these animals the tube had become dislodged from the pelvis of the kidney, and the ends were covered with kidney tissue. There was no urine in the bladders of other animals.

Table No. 5 (b) showing the duration of time between the operation and the first urine secreted when the kidney was drained by gauze.

Rabbit No. 1.—The pad over the drainage became moistened with a blue fluid between 6-7 hours following operation.

Rabbit No. 2.—The pad over the drainage became moistened with a blue fluid between 6-7 hours following operation.

Rabbit No. 4.—Gave birth to 6 rabbits two hours after operation. Died five hours after operation without secreting urine.

It was noted that the pads became wet with a blue fluid in each instance before seven hours. In one before five hours.

These animals were well 48 hours after operation and were killed at that time by the injection of strychnine. The autopsies showed the kidney tissue approximated by the sutures to be firmly adherent. The kidney tissue appeared normal with no evidence of blue stains. The gauze wick was firmly held in the kidney wound by the kidney tissue. The gauze extended into the kidney pelvis in each instance. There was a blue fluid in each bladder, and although the animals did not void urine up to the time at which they were killed (48 hours) they unquestionably would have done so if allowed to live longer.

Remarks. These last two tables show that the kidney secreted a blue fluid in each instance before eight hours, in most before seven hours, and that the time of the appearance of the

blue fluid was nearly the same with gauze as with rubber tube drainage.

It is to be noted that the kidneys drained with a rubber tube and by gauze secreted urine in about one-fifth of the time that was required for the urine to be voided when the kidney wound was closed entirely. Some time must be allowed in the latter instance for the collection of a certain amount of urine in the bladder before it escaped by the act of urination, yet even allowing several hours' time for this, it is unquestionable that the blue was secreted much earlier in the kidneys drained than in those which were closed tight.

As to the difference between the kidneys drained with the rubber tube and those drained with gauze, it is to be noted that the time of excretion of the blue was practically the same; the only difference between the results obtained with the two forms of drainage material being that all the animals drained with gauze had a blue colored urine in the bladder, while those drained with the tube had none, except in two instances in which the tubes had become dislodged from the kidney pelvis and the ends occluded by the kidney tissue. It may therefore be inferred that there is a freer escape of fluid from the kidney pelvis when drained with a tube than when drained with gauze.

To summarize. The points of this paper are:

First. That the rabbit normally urinates about every three hours.

Second. After performing a left sided nephrectomy, urine was not voided for from ten to eighteen hours except in one instance, when a blue urine was voided between four and six hours. (At least three hours and probably more time must be allowed for the accumulation of urine in the bladder before it was voided).

Third. After resecting a portion of the remaining kidney opening into the renal pelvis and closing the wound entirely, urination did not take place for from between 38 and 43 hours, and in one instance between 43 and 44 hours. (Here, too, several hours must be allowed for the accumulation of urine in the bladder before it was voided).

Fourth. After resecting a portion of the kidney and draining it with a rubber tube through the loin, urine was secreted in every animal before eight hours, and in most between six and seven hours. Except when the tube became dislodged from the renal pelvis, all the urine drained through the loin, none going down the ureter to the bladder.

Fifth. After resecting a portion of the kidney and draining it with gauze through the loin, urine was secreted in all the animals between six and seven hours except in one which showed a blue fluid between four and five hours. In each instance the urine drained both through the loin and down the ureter into the bladder.

Assuming these observations to be correct it becomes evident that following the operation of kidney resection and closing the kidney wound entirely, there results a temporary arrest of the kidney function. That performing the same operation and draining the kidney pelvis, not closing the kidney wound entirely does not cause a suppression of the kidney function in the same degree at least. That when the kidney pelvis is drained by a rubber tube, the drainage through the loin is freer than when the gauze is employed.

The writer is not prepared at present to offer any explanation for the facts here stated. These facts are simple observations, made as carefully as possible. They will be repeated. It is generally believed that the variation of the secretion of the kidney depends upon the blood tension within the organ, and by increasing the blood tension, the kidney secretes more, and by its diminution the organ secretes less.

In performing the operation of splitting the kidney, its blood tension must be disturbed, yet by closing the kidney wound it would seem that the tension should be greater than when drained. Accepting the idea that kidney secretion depends upon its blood tension as correct, the kidney should secrete more actively when closed by suture than when drained, which is not in accord with these experiments. It may be that the nerve influence governing the arterial tension within the organ exerts a greater

influence upon the secretory process than does the mechanical influence of the tension of the kidney tissues, and that by entirely closing the kidney wound, the nerve influence is disturbed in a greater degree than when the wound is but partially closed.

The succeeding steps of this experimental work will be directed toward establishing the facts here stated as correct, and then making observations upon the kidney secretion with changes in blood pressure, and if possible the elimination of the nerve influence.

DISCUSSION

Dr. Louis E. Schmidt of Chicago. I failed to hear some of the technical details of how the operation was carried out, but I am inclined to believe that the way you go about it has a great deal to do with the function of the kidney. Frequently clamps are advised to be used to clamp off the artery. I think when that is done there can be considerable injury. I think that of late it has been decided that it is best not to even compress the artery or vein with the fingers, but that with simply an incision into the kidney, and then with good hot compresses sufficient hemostasis can be established so that operative work can be done without clamping or compressing these vessels. I think this procedure of clamping off or compressing can be productive even if only for a short period of time of destroying the *function* of the organ, at least temporarily, even in some instances for a long period of time. Naturally the condition of the opposite kidney must be well established.

Dr. Hugh H. Young of Baltimore. I think the Association is to be congratulated in having these two excellent experimental papers. It seems to me our progress lies largely in experimental work, and I hope in the future to see more of it. Next year in Washington, when we expect to make a good showing in comparison with the other societies, I hope there will be quite a large number of such papers. I think the results of Dr. Cunningham's experiments are extremely interesting and important.

I for a long time have felt that a kidney that is opened for any operative procedure ought to be drained, in the first place to prevent the pressure of the kidney substance of the clot which is bound to accumulate in the kidney pelvis, and secondly because I have seen several cases which we closed without drainage in which the hemorrhage was much more extensive than where drainage was provided. As a rule both tube drainage and gauze packing should be provided.

DR. F. TILDEN BROWN of New York. In view of the clinical results from decapsulation of the kidney and the uncertain influences of this procedure it seems to me in these experimental tests of Dr. Cunningham that it might be worth while to see whether suture of the kidney cortex alone is at all different from sutures placed through both the cortex and the capsule.

DR. CUNNINGHAM. The point brought out by Dr. Schmidt is a very important one. Experimentally it has been shown by Ludwig that if one compresses the renal pedicle for a short period of time—that kidney often will not perform its function for hours and the urine when found contains albumin. It is one of the physiological experiments which have entered a great deal into the discussion of the physiology of the kidney. I think it a very important point, that the pedicle should not be touched unless the kidney is going to be taken out.

DR. YOUNG. They were not either in your cases?

DR. CUNNINGHAM. Where a portion was resected the pedicle was not touched. The kidney was simply dislodged from its bed by severing the layer of peritoneum outside of the greater curvature of the kidney, pulling it forward, dislodging the kidney from its bed and presenting the greater curvature in the wound. The incisions were made, and two sutures were passed through the kidney substance immediately after the wedge had been removed.

That in part answers Dr. Brown's question as regards the capsule. It is quite impossible in the rabbit to place sutures through the kidney substance and have them hold unless one includes the capsule, and I think this also is quite true in the human. We get a better hold by including the capsule in the sutures. It is quite impossible in this work that I have done to bring the cut edges of the capsule closely together. There is often a gap between the cut edges of the capsule in which the kidney tissue presents. As the incision is made in the kidney the capsule retracts considerably and it is difficult to bring it back together. This was attempted, because the function of the kidney may depend somewhat, of course, upon the tension within the organ produced by the capsule. I was sorry that I could not get the capsule together.

DR. L. BOLTON BANGS of New York. What I am about to say may have some clinical bearing. I often recall the experiment made by Israel with his rubber tube which no doubt you are all familiar with, where in a case of nephrectomy he discovered that if the rubber tube was placed strongly against the stump it produced anuria in the opposite kid-

ney. And he repeated the experiment so as to demonstrate it to his own mind that the presence and pressure of a rubber tube was the cause of anuria. In my own practice, having a firm belief that it is best to maintain all the functionating structure of the kidney possible, I never suture them. I tamponade, bringing the two surfaces together with a firm tamponade. Now, when the question is raised in my own mind, as it is now, as to how soon after the operation that kidney functionates, I am unable to answer, but from my surgical experience I have been satisfied that it is better practice not to take the risk of destroying even a small portion of the functionating tissues of the kidney.

INSTRUMENTS FOR EXTERNAL AND INTERNAL URETHROTOMY

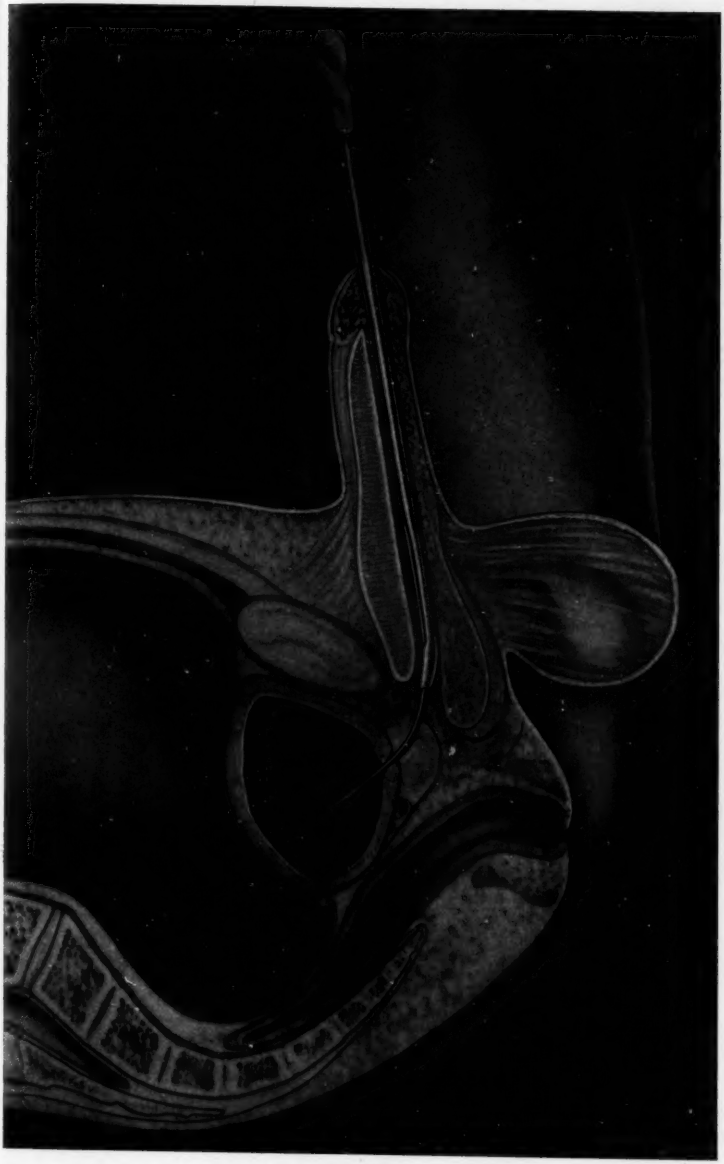
By HENRY H. MORTON, M. D., of Brooklyn.

IN 1894, Dr. Henry W. Rand presented before the Brooklyn Surgical Society the instruments which it is the object of this paper to describe. In consequence of the untimely death of Dr. Rand soon afterwards, the instruments were never really brought to the attention of genito urinary surgeons, although they were described in an article in the *Brooklyn Medical Journal* in 1894, and have been figured in Tiemann's Catalogue, and on Page 168 in "Genito-Urinary Diseases and Syphilis," by H. H. Morton.

The same idea in regard to the staff also occurred to Dr. Hayden, who, curiously enough, overlooked the literature on the subject in presenting a similar staff before the Association in 1907.

Every genito urinary surgeon has experienced the difficulty of reaching the bladder in a case of tight stricture where it was impossible to introduce a guide. And it sometimes happens that a guide may have been passed into the bladder, but in attempting to divide a tight stricture with the fine Gouley knife, the guide has been accidentally cut through and the operation has to be completed without its assistance. It was this accident which Rand noticed once at an operation by one of the best genito

PLATE XVI.—Presented by Dr. Henry H. Morton.

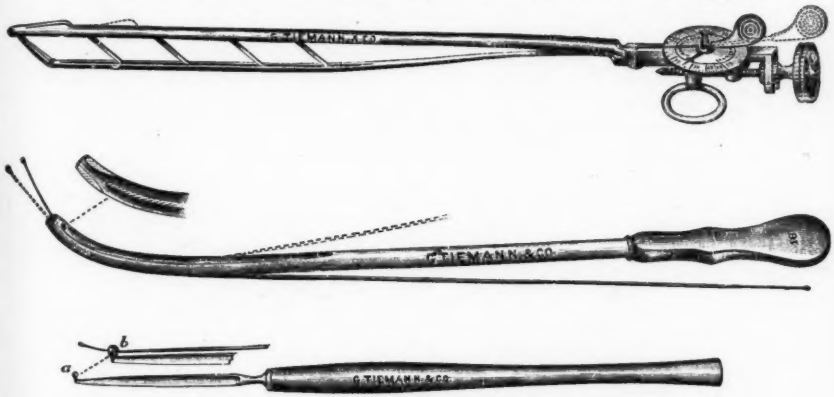


Rand's Staff introduced over a filiform guide to face of structure.

urinary surgeons of his day, and which also occurred once in an operation which he was doing himself, that gave him the incentive to devise the staff and knife which I present to-day.

The staff is the ordinary tunnelled sound made to slip over a filiform guide, but while the tunnelled sound is provided with one groove on its convex surface, this instrument has two grooves, one on the convex side and the other on its concavity. It is intended that the filiform guide shall lie in the groove on the concavity of the staff thus protecting it from the danger of being severed accidentally.

The knife has a very narrow blade with a small ring fixed at its end, just large enough to slip over a guide. The ring pre-



vents its deviation from the guide and it is impossible to get astray.

The technique of the operation is as follows:

A filiform guide is introduced through the stricture into the bladder and the patient placed in the urethrotomy position.

The staff is slipped over the guide, the guide resting in the groove on the concavity, until the point rests against the face of the stricture.

The urethra is opened in the perineum by cutting down upon the end of the staff. Hemorrhage is prevented by press-

ing with the finger and thumb on either side of the urethra. When the urethra is reached it is made to stand out prominently in the perineum by blunt dissection; it is then opened in the median line.

The staff is withdrawn from the urethra, the guide being held with forceps to prevent it from being pulled out of the bladder. The long end of the whalebone guide is then brought out of the wound in the perineum, the other end remaining in place in the bladder. Rand's knife is then threaded over the guide and pushed forward toward the bladder, and through the stricture cutting its fibres sufficiently to admit a gorget, which is carried into the bladder.

Any remaining stricture bands which have not been severed by the ringed knife should now be divided on the floor of the urethra with a blunt pointed straight bistoury using the gorget as a director.

Operating in this way it is impossible to get on with a much smaller incision than is usually made in the urethra. If a larger incision has to be made it is usually desirable to partially close the wound in the urethra with sutures and also the skin and muscle lying over it. This partial closing of the wound around the tube hastens the process of repair materially so that a week after the operation the patient is passing the whole or nearly all of his urine through the urethra.

The final step in the operation consists in introducing a large, soft rubber perineal drainage tube through the wound into the bladder and holding it in place by a stitch through both lips of the wound and the tube.

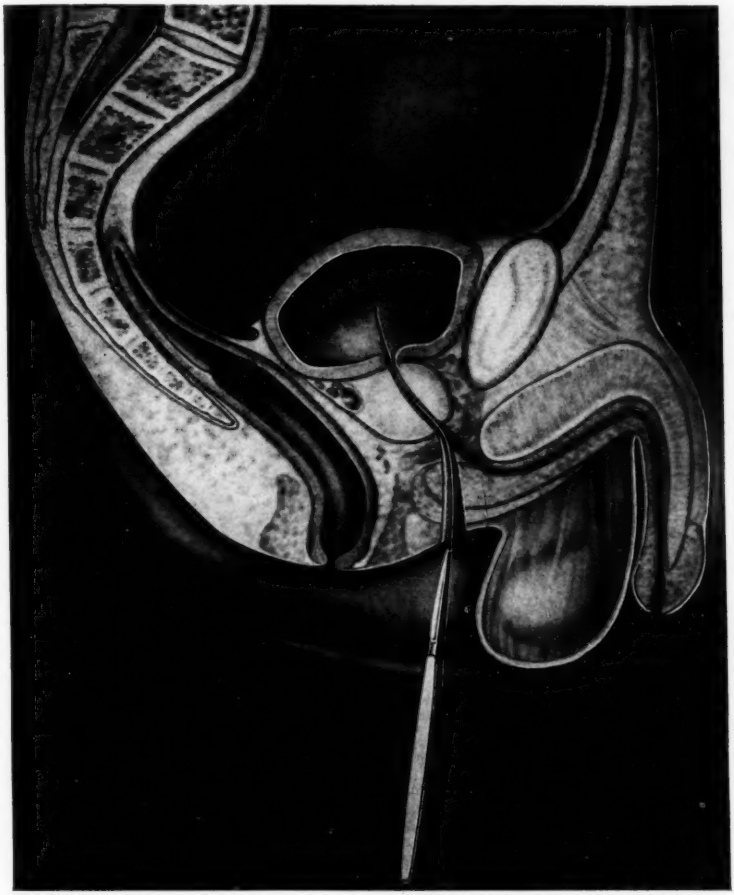
The wound is packed around the tube with strips of iodoform gauze to prevent hemorrhage.

The other instrument which I desire to present is Rand's modification of Otis' urethrotome.

The change consists in the small knob at the end in which the knife lies concealed.

This projection is intended to serve as a bougie à boule to locate the stricture at the point where it should be cut.

PLATE XVII.—Presented by Dr. Henry H. Morton.



Rand's Knife introduced over filiform guide, preparatory to cutting structure.

The instrument is introduced into the urethra closed. After the point has entered behind the stricture the blades are separated by means of the screw to the full extent which the calibre of the stricture will allow. The instrument is then withdrawn until the projection at the end catches against the stricture and is held. By the feeling of resistance on withdrawing the instrument the surgeon knows that the projection which conceals the knife lies in close contact with the stricture at the point at which it should be cut. The knife is then withdrawn for an inch, cutting through the stricture towards the roof of the urethra.

By turning the screw and separating the blades more widely than was before possible, it is demonstrated that the stricture has been cut through.

The knife is again pushed back into its place of concealment and the urethrotome is drawn out towards the meatus and any other stricture bands are located and cut in the same way.

DEMONSTRATION OF INSTRUMENTS FOR URETHROSCOPIC EXCISION OF MEDIAN PROSTATIC BARS

By Hugh Hampton Young, M. D., of Baltimore.

OBSTRUCTION to urination from a simple bar formation in the median portion of the prostate is not a very rare condition. Most often it is associated with more or less enlargement of the lateral lobes of the prostate, and in such cases is an indication for prostatectomy in which all three portions of the prostate should be removed. There are, however, quite a number of cases in which the median portion is alone involved, and not infrequently this occurs in fairly young men so that a radical operation such as perineal or suprapublic prostatectomy is generally to be avoided if possible.

In a series of 358 cases of chronic prostatitis, which were exhaustively studied by the writer in conjunction with Drs. J. T. Geraghty and A. R. Stevens,* there were 34 cases in which there was obstruction to urination from formation of a bar or trans-

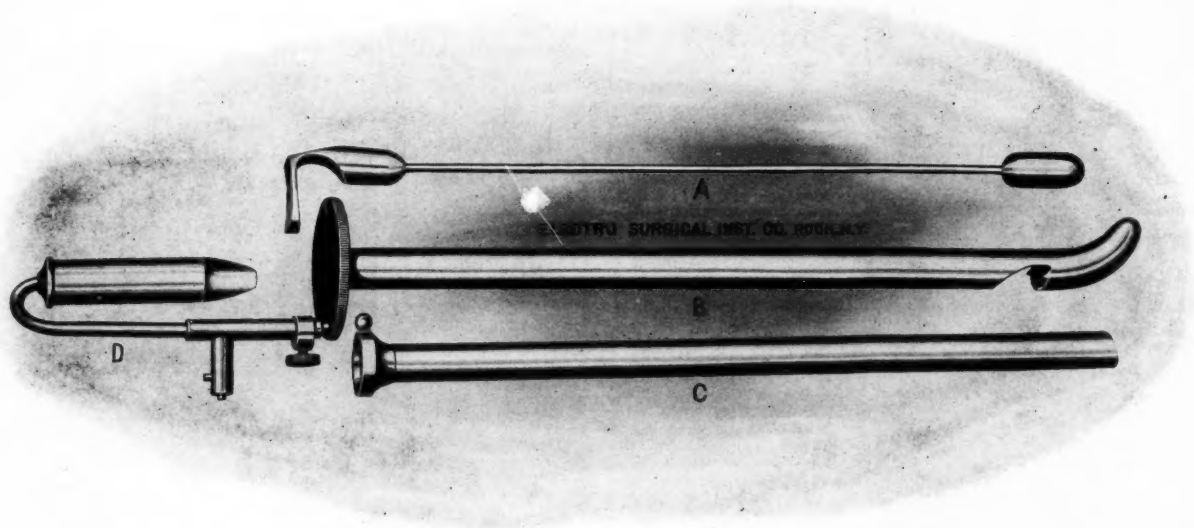
* Johns Hopkins Hospital Reports, vol. XIII., 1906.

verse elevation in the median portion of the prostate. In 50% of the cases the obstruction had led to hypertrophy of the bladder, more or less trabeculation and contracture of the vesical cavity, the capacity varying from 65 to 150 cc. These cases in which the bladder was markedly contracted often showed very little residual urine. In four cases the residual varied from 65 to 150 cc. In one case it was 440 cc. and in two cases the retention of urine was complete and the patients were leading catheter lives. Several of these patients were subjected to perineal prostatectomy, and a pathological study of the tissue removed showed inflammatory infiltration, endoglandular proliferation, fibrous tissue formation and infiltration among the muscular bundles of the sphincter leading to sclerosis and contracture of the prostatic orifice besides the formation of a definite hypertrophic bar.

Since the publication of this report, I have seen numerous other cases of chronic obstructive prostatitis, and there have been six cases in which I performed perineal prostatectomy to remove the obstruction. With one exception these cases have been under 40 years of age (ages 25, 31, 37, 37, 39, 41), and one case was under 30 years of age. In four cases retention of urine was complete and catheter life had been followed for varying periods; in one case for 12 years. In one case there was 500 cc. residual urine and the catheter was occasionally necessary on account of complete retention of urine. In one case the bladder was markedly contracted (held only about 100 cc.), and the amount of residual urine was small although there was a definite bar present. In almost all of these cases the lateral lobes were very little, if at all, enlarged, apparently causing no obstruction to urination, and on that account it seemed unnecessary to remove the lateral portions of the prostate.

The results obtained by these operations have been very satisfactory, but I have felt that the proper method of attack would be through the urethra with an instrument so constructed as to excise the median bar without performing perineal section.

Several months ago I devised and had constructed an instrument for this purpose to be used in connection with a urethroscopic lighting apparatus of the external type, somewhat similar



Urethroscopic median bar excisor. (a) Obturator. (b) Outer fenestrated tube for catching the median bar. (c) Inner sharp cutting tube for excising the median bar. (d) External illumination.

PLATE XVIII.—Presented by Dr. Hugh H. Young.

to that of Otis, which I had recently devised and had constructed by the Electro Surgical Instrument Co. A glance at this instrument shown in Plates XVIII and XX, will give an idea of its construction.

Using the external lighting apparatus as above described, an instrument was constructed as shown in Plate XVIII, Fig. B, with a fenestra on the convex surface which was intended to engage the median bar and with an internal tube with an oblique steel cutting edge as shown in Fig. C by which the bar can be excised; the whole operation being performed under the guidance of the eye.

The technique which has been found most effective is as follows: The urethra is first irrigated with 1:100,000 bichloride of mercury, a catheter is passed and 4% cocaine is injected into the bladder, posterior and anterior urethra. After two minutes the bladder is filled with 1 to 100,000 bichloride of mercury solution and the operating urethroscope, with the obturator, A, in place or with the inner tube pushed home so as to fill the fenestra, is inserted until the beak is felt to enter the bladder for a very short distance. The inner tube is then withdrawn about 1.5 cm., enough to uncover the fenestra and the cavity is dried with swabs. A small portion of the floor of the urethra is generally seen bulging into the fenestra, sometimes the verumontanum. The instrument is then gradually pushed deeper, the operator at the same time looking through the tube until finally the median bar is seen to "pop" into the fenestra. This is generally accompanied by the escape of a small amount of fluid from the bladder into the

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This urethroscopic apparatus is provided with straight tubes Nos. 26 and 28, made of silver so as to get better reflecting surfaces (and thus to increase the amount of light carried to the bottom of the urethroscopic tube). Two tubes, Nos. 26 and 28, of the Swinburne posterior type with curved beaks and various instruments for operation (scissors, rongeur, porte d'argent, curettes, etc.). This instrument is also provided with an external attachment connecting with a rubber bulb by which the urethra can be filled with air and operation can at the same time be performed. The advantage of the external light is that it gives a larger field for manipulation; that aseptic technique is better (those with internal lamps cannot be boiled), and there is no lamp at the bottom of the wound to become smeared with blood or entangled with the cotton swabs.

tube, but by drawing the instrument slightly outward this is stopped and the median bar is found firmly held in the fenestra by its hooklike inner margin (as shown in Plate XIX). The inner tube is then simply pushed home and a distinct resistance will be met with while a large section of the median bar is thus divided. Without removing the instrument the rongeur forceps are inserted and the excised specimen removed. It is generally advisable to make the cut on each side of the median line obliquely outward and backward in order to completely remove the bar, and on this account the instrument is first turned 45° to the right, the inner tube partly withdrawn, the field dried with a swab, and then inspected to see that the desired portion has been entrapped, when the tube is again pushed home and the section removed as before with the forceps. The left lateral oblique portion is similarly removed and the instrument then withdrawn.

The entire procedure causes very little pain, and takes only a few minutes. The amount of hemorrhage will sometimes be fairly abundant, but is usually controlled promptly by the insertion of a large coudé catheter which is fastened in the urethra after the bladder has been washed free from blood. The patient is then returned to his room and given 50 to 60 grains of urotropin daily and large amounts of water to drink. The catheter is removed at the end of 24 hours as a rule and subsequent catheterization is usually not necessary.

In no cases has there been any shock accompanying the operation which is much more simple than any form of prostatectomy. A few cases in which this procedure has been used may be of interest.

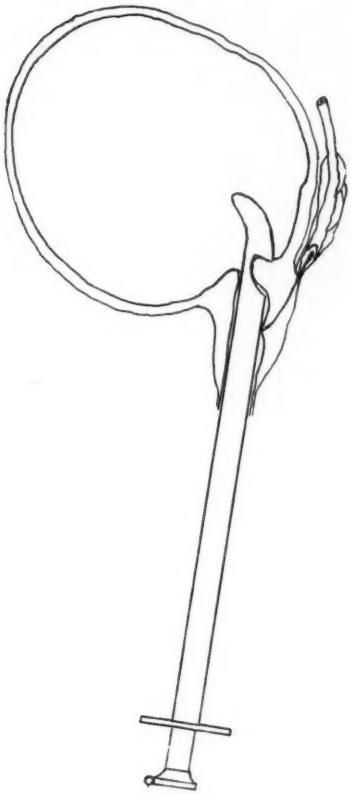
CASE 1. No. 1887. R. F. Aged 32, married.

Complaint. "Difficulty of urination."

Patient says that as a boy he remembers that it always took him longer to empty his bladder than it did other boys, and that the stream was small and less forcible than normal.

In 1897 he contracted a specific urethritis, a severe infection which became complicated by cystitis and right sided pyelitis. Subsequently there was marked impairment of health, urine from

PLATE XIX.—Presented by Dr. Hugh H. Young.



time to time became extremely cloudy and was occasionally complicated by complete retention of urine necessitating the use of a catheter. Throughout this period a marked irritability of the vesical neck was noticed leading to frequent interruption to the act of urination. In 1906 he developed definite swelling and tenderness in the right side and consulted Dr. von Eberts of Montreal, who removed the right kidney. Following the operation severe pyuria continued and somewhat later a suprapubic cystotomy was performed and an opening was discovered external to the right ureteral orifice, through which a quantity of pus exuded. Examination showed a large diverticulum which was removed at a third operation three months later. The bladder was closed extravesically and the patient made an excellent recovery, but the suprapubic fistula persisted and examination showed obstruction at the prostatic orifice. The sphincter was widely dilated, the suprapubic wound curetted and after that promptly healed, but the patient still had a residual of about two ounces continually present.

In April, 1908, he returned to Dr. von Eberts complaining of obstruction to urination and a cystoscopic examination by Dr. Campbell revealed the presence of a definite median bar and on the advice of Dr. von Eberts the patient came to me for perineal prostatectomy.

Rectal examination showed a prostate normal in size and only slightly indurated. The cystoscope showed a definite slightly rounded median bar. There was no enlargement of the lateral lobes. The residual urine amounted to 40 cc. and the bladder capacity 440 cc. A depressed scar was seen on the right side of the bladder from which the diverticulum had been removed. The left ureteral orifice was dilated and the fluid escaping from it appeared to be cloudy. The right kidney had been previously removed, and on this account I decided not to perform prostatectomy, but to try dilatation of the vesical neck and prostatic massage to see if the obstruction to urination could not be removed. Patient was treated for several months with distinct benefit, but urination never became free. There was still from

40 to 60 cc. residual urine present, and there was usually considerable hesitation in urination and the stream was small and several attempts were required to apparently empty the bladder.

A few weeks ago he returned saying that the obstruction was still present. There was difficulty in starting the flow of urine and the stream was small and urination slow and difficult. The urine was still cloudy and contained shreds and pus.

The prostate on rectal examination was not enlarged, but there was still about 50 cc. residual urine present and a definite elevated, somewhat rounded median bar.

Operation. Under cocaine anesthesia the median bar was excised as described above. The first piece of tissue removed measured 1.5 cm. long and about 8 mm. in diameter and comprised most of the median bar. The operation caused very little pain and very slight hemorrhage.

Patient remained in the hospital for 24 hours and then returned home. He did not require catheterization and there was an immediate improvement in the act of urination. The obstruction was apparently completely removed from the time of the operation.

Patient returned for examination four weeks later. He says that he feels completely relieved, has never been able to void so freely as now. Does not have to get up at night to urinate. There is no hesitation and the stream is large. Sexual powers are normal. Catheter passes with ease and finds no residual urine. Bladder capacity on forced distention is 500 cc. The cystoscope shows a complete absence of the median bar and in fact the internal orifice appears a little dilated. He has no pain and considers himself entirely cured.

CASE 2. No. 841. J. E. B. Aged 64.

Complaint. "Irritation at the neck of the bladder."

Patient had been treated off and on for four years by prostatic massage and occasional dilatation of the urethra. Under this treatment the irritation had been markedly improved, but the patient still complained of distinct obstruction to urination which of late has become worse.

Patient returns and says that urination has of late been more difficult, considerable hesitation, stream small and when the desire comes on it is very urgent and painful, and he frequently has to void every one or two hours and arise four times at night to void. Catheter shows 90 cc. residual urine. The prostate on rectal examination is slightly hypertrophied.

May 10, '09. Under local cocaine anesthesia the median bar was excised with the operating urethroscope as described above. The first specimen removed measured 2 cm. long x 8 mm. in diameter. The instrument was then turned to the right posterior direction and a small section excised. There was very little pain, and only a moderate amount of hemorrhage. A catheter was fastened in the urethra and allowed to remain in for two days. The patient left the hospital on the fourth day and one month later reported that he was greatly improved; that he passed urine freely without hesitation and that the urgency which was present before operation had completely disappeared.

A catheter passed with ease and found 40 cc. residual urine. The bladder capacity, on forced distention, was 460 cc. and the tonicity was good.

July 6, '09. Patient says he feels completely cured. He is able to retain urine seven or eight hours, voids without hesitation in a large stream with normal force, without pain or burning and feels perfectly well.

Urine is clear. There is no infection. The catheter passes with ease and finds 23 cc. residual urine. The bladder capacity on forced distention is 500 cc.

Sept. 16, 1909: "I feel greatly improved but not cured entirely. The burning has returned and bladder is somewhat irritable."

CASE 3, No. 2124. A. S., aged 48. Admitted March 29, '09. Patient says that since boyhood urination has never been free. There has always been some hesitation and the stream has been small and urination slow. About 19 years ago he had gonorrhœa and since then has had almost constant

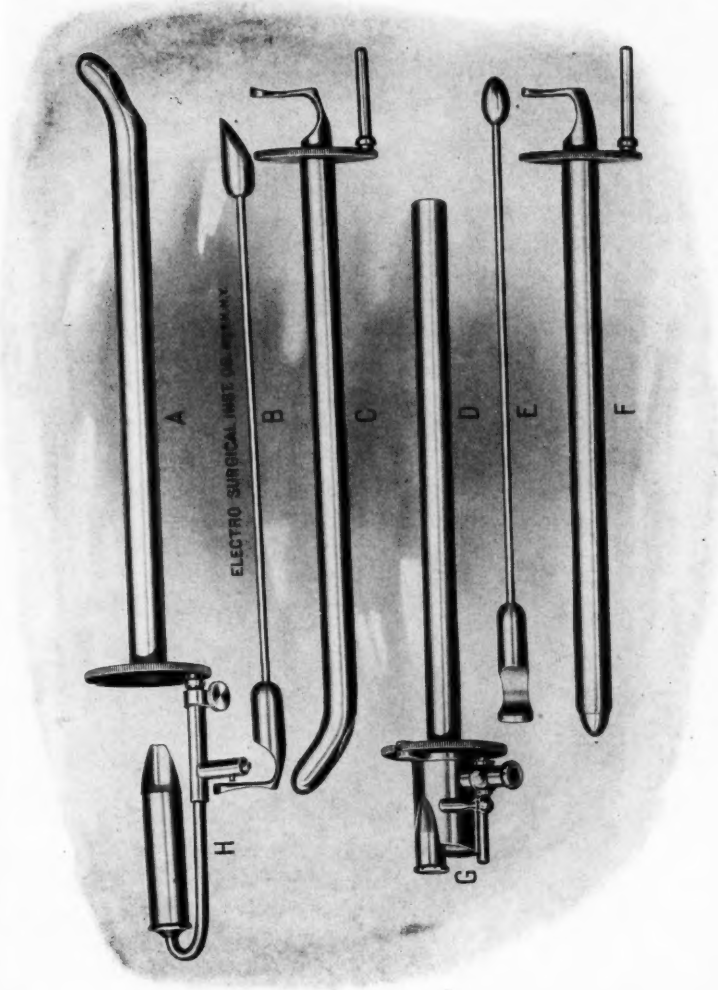
burning in the neck of the bladder. This burning has become gradually worse especially during the last six months. The trouble for which the patient seeks relief is the fact that the urine will not start freely. When he attempts to void he has to stand and wait before the urine will flow, then the stream is small and considerable straining is necessary. He has to get up about every three hours at night to urinate. There is present almost constantly a smarting and burning sensation at the neck of the bladder and also a dull pain in the suprapubic region when the bladder become full. At times he has a severe pain, almost spasmodic in character, lasting for many hours, apparently not associated with urination or vesical distention. During the day he voids about every three hours, and when the desire comes on he has to urinate very quickly. Occasionally he has to void every hour. He has been treated by sounds, prostatic massage, etc., with no benefit.

In 1906 the patient consulted Dr. Heidingsfeld of Cincinnati, O., who thus very accurately summed up the situation in the accompanying letter which he gave the patient.

"Oct. 22, '06. I made a careful cystoscopic examination yesterday and find that the bladder is strongly trabeculated. This necessarily means that the bladder is compelled to do an abnormal amount of work and I also found that the third or middle lobe of the prostate is hypertrophied, and in all probability sufficiently so to elevate the floor of the urethra and thus produce obstruction to the outflow of urine. This anomaly is rather rare and usually dates from birth and is sufficient to account for all the symptoms of which the patient complains. His trouble is entirely irremediable to treatment, except in the form of a radical operation and his symptoms at present justify such a measure in no respect. The chances are the condition will remain unchanged almost indefinitely, but in case there should be an unfavorable change in the future, a radical operation, that is to say, prostatectomy, of this third lobe will always afford him proper relief."

On examination the prostate is found to be about normal in

PLATE XX.—Presented by Dr. Hugh H. Young.



Shows urethroscope with external illumination adjustable; straight and curved tubes and detachable apparatus for distention of the urethra with air and simultaneous operation.

size, slightly irregular, moderately indurated and with few adhesions. The seminal vesicles are negative. Prostatic secretion contains very few pus cells in very small number. The urine is cloudy and shows microscopically a great many diplococci which do not decolorize by gram, and a few pus cells.

Cystoscopic examination. A catheter passes with ease and finds about 10 cc. residual. The bladder capacity on forced distention is about 500 cc. The cystoscope shows a slight, but definite, rounded, fairly well elevated, median enlargement with a shallow sulcus on either side. The lateral lobes are not definitely hypertrophied. Operation (at the office) after introduction of 4% cocaine into the urethra. The median bar was excised with the urethroscopic instrument as described above. The piece removed was 1.5 cm. long and 8 mm. in diameter, half of its surface was covered with mucous membrane. Examination of the cut surfaces showed distinct evidence of glandular hypertrophy. The operation caused very little pain. The patient voided urine immediately afterwards. There was only a moderate amount of hemorrhage. He had no chill or fever following; did not have to be catheterized and after two days the urine was free from blood. Six days after the operation the patient returned home. At first there was considerable irritability during urination, but never any incontinence.

On April 29th he returned for examination. He says that urination is much more free and the stream is larger. He notices particularly great improvement in the ability to void freely with a large stream and the abscene of burning sensation. Examination with the cystoscope shows that most of the median bar has been removed, but there still remains a slight elevation.

June 19, '09. Patient returns saying that while he is greatly improved he is not cured. The cystoscope shows a slight but definite elevation in the median portion of the prostate, and patient is advised to submit to a second operation. This was done as before, one piece of tissue being removed posteriorly from the median portion of the prostate and one from the right lateral aspect, on account of a small prominence which was seen

there. The amount of tissue removed was less than at the first operation, but there was more hemorrhage and a retained catheter was provided and the patient put in the hospital. On the third day the catheter was removed and the patient left the hospital on the fifth day. The urine was still cloudy and contained bacilli, but the amount of urotropin was increased and the infection gradually disappeared. He was dilated three times with the Kollman dilator which was pushed far in so as to dilate only the internal sphincter, and carried up to 40 F.

July 3, '09. Patient says that he feels entirely relieved. Voids urine without hesitation, in a large stream and without pain. The irritation has completely disappeared. A catheter passes with ease and finds no residual urine. The urine is free from infection and contains only a few leucocytes.

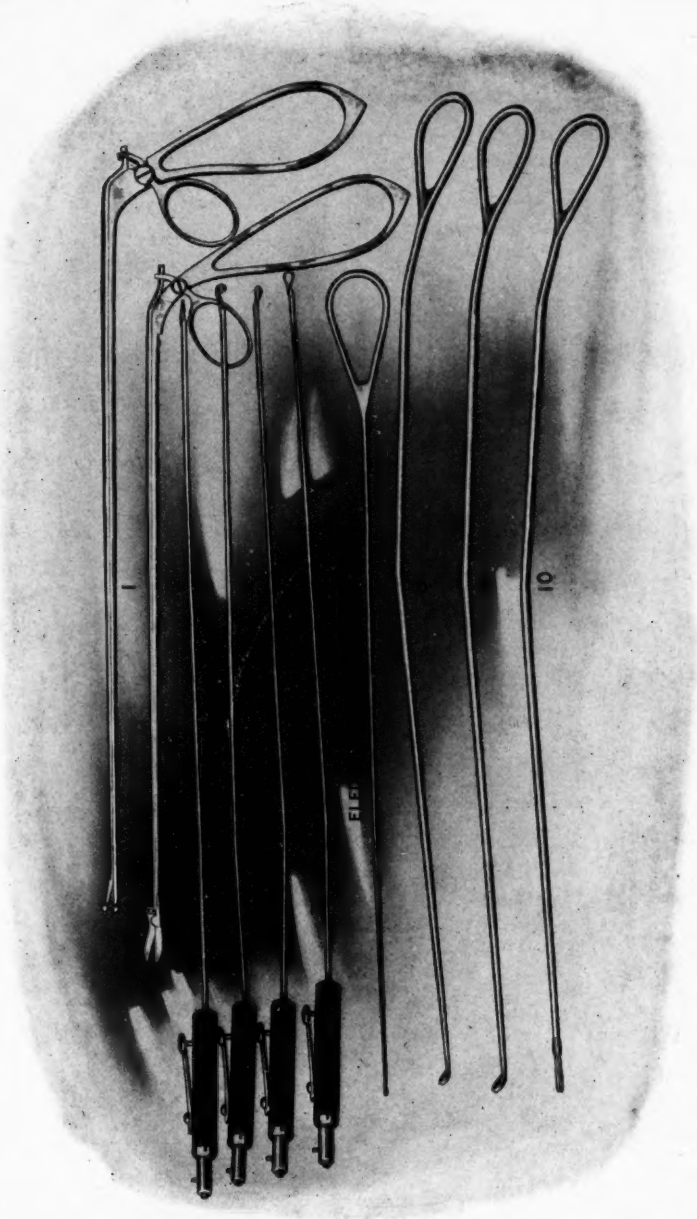
CASE 4. No. 2129. M. H. C., aged 58. About three weeks ago for the first time patient had a severe pain in the suprapubic region which came on in paroxysms just after urination and was located in the deep urethra and neck of the bladder. The urinary stream was small and slightly difficult. After a few days the acute symptoms disappeared but since then he has had to void several times at night. Urination has been urgent and the stream small and generally associated with a burning pain in the deep urethra and neck of the bladder. He now has to urinate about every hour and besides the burning pain in the deep urethra there is a dull aching sensation in the suprapubic region.

Examination. The prostate is about normal in size and shape. The urine is slightly cloudy. It contains a few pus cells and a few small bacilli. There is no marked urinary infection, however.

Cystoscopic. The cystoscope shows a small median bar and immediately behind it in the anterior portion of the trigone there is a small rounded elevation which suggests slight hypertrophy of the subcervical group of glands beneath the trigone. The lateral lobes are not at all enlarged.

April 7, '09. Operation under local cocaine anesthesia.

PLATE XXI.—Presented by Dr. Hugh H. Young.



Various instruments for urethroscopic and vesical operations.

The urethroscopic excisor was first introduced into the bladder, the obturator withdrawn, and the instrument gradually drawn outward until the small rounded mass in the anterior part of the trigone protruded in the fenestra. The handle was then elevated so as to catch this and the instrument was drawn out further until the median portion of the prostate also presented in the tube. The cutting inner tube was then pushed home excising a piece of tissue 8 mm. in diameter and 1.2 cm. long which was found to be composed of two distinct rounded elevations, probably corresponding to the enlargement of the median portion of the prostate and the anterior portion of the trigone. There was fairly abundant hemorrhage and four hours later patient required catheterization and several large clots were evacuated. After that there was very little hemorrhage. Patient remained in the hospital four days and returned home a week after the operation. At that time he remarked that urination was more free than it had been for a long time, and that he could retain urine for five hours. The urine was clear. May 18, '09. Patient returns for observation. He says that his convalescence has been uninterrupted. He is now able to retain urine for nine hours, does not get up at night, voids freely without hesitation or straining, in a large stream and feels entirely well. His sexual powers are apparently normal. The urine is clear. A catheter passes with ease and finds no residual urine. The bladder capacity on forced distention is 360 cc. The cystoscope shows that there is still a very slight bar on the right side and that a small portion of the rounded elevation on the trigone remains on the right side. As there is apparently no obstruction present the operation was not repeated, but this case shows the advisability of removing the median lobe in three pieces.

Sept. 16, '09. Letter. I urinate freely without hesitation or pain, and do not get up at night to void. I consider myself cured.

CASE 5. No. 1908. C. S., aged 36. Admitted June 3, 1908. Patient says that for many years he has had hesitation at the beginning of urination and the stream has been unsatis-

factory and slow. About six years ago he acquired gonorrhœa which involved the prostate and became very chronic. Until last year he suffered with prostatorrhœa and a burning sensation during and after urination with a pain which radiated to the end of the penis. His sexual powers are gradually diminishing.

Two months ago he consulted a specialist who catheterized his ureters and found pus and staphylococci from both kidneys. He now complains of hesitation, frequency and distinct difficulty of urination and irritation and burning in the neck of the bladder and urethra. He has no pain in either kidney. The prostate is about normal in size, smooth, slightly indurated. The seminal vesicles are negative. The prostatic secretion contains pus cells. The urine is cloudy with pus and contains staphylococci. A catheter passes with ease and finds a small amount of residual urine. The bladder is contracted and will admit only 200 cc. The cystoscope shows a distinct elevation in the median portion of the prostate in the shape of a slightly rounded bar. The bladder is uniformly red and moderately inflamed. The ureteral ridges are hypertrophied and the left ureteral orifice is round and patent. The urine coming from it is slightly cloudy. The right ureter is normal in shape and the urine is clear.

The patient was treated by prostatic massage, irrigations, dilatations of the posterior urethra and urotropin in large amounts to combat the renal infection. Under this treatment he improved and after two weeks returned home and took a trip to Europe.

Patient then returned on January 15, '09. The condition was about the same. Urination still more frequent than normal, bladder capacity on forced distention 250 cc. The cystoscope still showed a small median bar. The urine was cloudy and contained staphylococci. Patient was treated as before by prostatic massage, dilatations, irrigations and urotropin with considerable improvement in the irritation, but not in the frequency of urination.

On March 30, '09, urethroscopic examination was made and

the verumontanum touched with nitrate of silver. On April 27th, he returned saying that he still had considerable irritation in the neck of the bladder, urination was still difficult, slow to start, more frequent than normal and often associated with a deep seated pain.

Cystoscopic examination. The patient voided all that he could. A catheter was then passed and withdrew about 20 cc. residual urine. The bladder capacity, on forced distention, was 220 cc. The cystoscope showed a definite median bar and also a slight thickening of the lateral portions of the prostate. There was a definite pouch behind the median bar and the bladder was distinctly trabeculated. On rectal examination the prostate was about normal in size, smooth and only slightly indurated. The urine is still cloudy and contains pus and cocci. Patient had then taken urotropin 80 grains daily for many months and also been treated by autogenous bacterial vaccines and vigorous local treatment, as described above, for a long period with very little benefit. It seemed evident that most of the symptoms were due to the presence of the median prostatic bar. Patient was therefore operated upon at the office, with the urethroscopic excisor, after the introduction of 4% cocaine in the urethra. The median bar almost completely filled the lumen of the tube and when excised the piece of tissue removed measured 8 mm. in diameter and 1.7 cm. long. The operation caused very little pain and only moderate hemorrhage, but the patient went to the hospital where catheterization was necessary on account of blood clots. After three days he returned home.

June 3, '09. Patient reports in person—says he is greatly improved in that he is able to void urine without hesitation and in a large stream, and is able to retain urine for six hours at night. There is still slight pain in the deep urethra at the end of urination.

A catheter passes with ease and finds 10 cc. residual urine. Bladder capacity on forced distention is 260 cc. The urine is still cloudy and contains a few cocci. The patient is advised to be-

gin urotropin again and to wash out the bladder with 1 to 5000 nitrate of silver.

Patient reports (about June 30) that he is entirely well. Says that he voids urine without hesitation, no difficulty, large stream, urination at intervals of five hours and can practically hold it as long as he pleases. Does not get up at night to urinate. Feels perfectly comfortable.

Examination. Catheter passes with ease and finds no residual urine. Bladder capacity on forced distention is 300 cc. Patient says he is able to introduce 350 cc.

Sept. 16, '09. "I void freely without hesitation except when there is irritation or burning. I am certainly greatly improved."

CASE 6. No. 2133. A. L. P. Aged 44. Patient states "as far back as my memory goes I have not voided my bladder in a normal manner. I have always had to wait. Fifteen years ago I had an attack which was called catarrh of the bladder characterized by a desire to void every 15 minutes. Catheterization became necessary, but after a month the trouble disappeared. For many years I have had a feeling of extreme fullness of the abdomen. On April 1, '08, an attack similar to the one 15 years ago commenced and after voiding urine every half hour for a month a catheter was used and 32 ounces of urine withdrawn. The full feeling of the stomach at once disappeared and my digestion which had for years been abnormal soon became good. Except during the two acute periods of 30 days there had never been a strong desire to urinate, in fact I can go five or six hours and not even then be uncomfortable. Practically no urine can be voided unless there is 12 or more ounces of urine in my bladder and even then often only an ounce or two can be voided, except after intercourse then five or six ounces can be voided with great ease. Various treatments have been tried by physicians but without benefit." For several months the patient has been using a catheter three or four times a day and removing each time a large amount of urine and being practically unable to void unless the bladder becomes full and then only about an ounce can be voided at a time.

Examination. The prostate is about normal in size, uniform, slightly firmer than normal. The seminal vesicles are slightly thickened and adherent. The prostatic secretion contains many pus cells. The urine is cloudy and contains pus and bacilli.

Cystoscopic examination. The patient could not void urine, having been recently catheterized. The bladder capacity was apparently about 400 cc. The cystoscope showed a definite rounded enlargement of the median portion of the prostate with a shallow sulcus on each side. The lateral lobes were apparently not intravesically enlarged. The bladder was moderately trabeculated and the trigone was quite prominent and behind it was a marked pouch. The ureteral orifices appeared normal. With finger in rectum and cystoscope in the urethra there was a distinct thickening in the median portion of the prostate.

April 8, '09. Under local cocaine anesthesia one piece of the median bar was excised with the urethroscopic instrument as above described. There was a moderate amount of hemorrhage which lasted for 48 hours, patient requiring catheterization. On the third day the patient suddenly voided a large amount of urine with a good stream, but urination again became difficult and the catheter had to be resorted to again. The piece removed measured 6x8x12 mm.

On April 12, '09, the obstruction persisting, a second operation was performed, two small lobulations being removed from the median portion of the prostate. The patient was then sent home.

On April 25, '09, he returned and cystoscopic examination showed a small globular intraurethral projection from the right lateral lobe which presented anteriorly. This had never been seen before and an attempt was made to remove it at the office with the urethroscopic excisor, but with very little success.

On May 25th, the fourth operation was done under ether. The cystoscope showed a definite rounded elevation of the median portion of the prostate and also a small globular enlarge-

ment of the right lateral lobe. Four pieces were removed from the region of the median bar and one small piece in an attempt to remove the right antero lateral intraurethral lobule. A catheter was retained in the urethra for four days. There was only a moderate amount of hemorrhage. After this operation he was at times able to void fairly freely and almost empty the bladder so that the residual urine was sometimes only 100 cc. At other times urination was difficult and from 400 to 800 cc. of residual urine were present. The urethra was dilated with a Kollmann dilator and the patient was instructed to return home and have the urethra dilated twice a week.

June 19, '09. Patient reports for examination. He says that his posterior urethra has been dilated up to No. 41 F three times a week and on the morning after dilatation he is usually able to void a fair stream. He uses a catheter only at bed time and finds 6 to 15 ounces of residual urine. There is still some obstruction to urination and several attempts are necessary to complete the act. The prostate is about normal in size. The patient voided 50 cc. A catheter was then passed and found 260 cc. of residual urine. The bladder capacity on forced distention was 890 cc. The vesical tonicity was apparently very poor. The cystoscope showed that the median bar has been completely removed, in fact it is more concave than normal and level with the anterior portion of the trigone. Projecting in the urethra from the right anterior-lateral aspect of the prostate was a small globular lobule and it was presumed that this was responsible for the obstruction.

June 25th. Under ether an attempt was made to remove this lobule using the rongeur cystoscope with which a small globular mass about one cm. in diameter was removed. Several other attempts were made with the rongeur cystoscope, but there was no more tissue obtained. The operating urethroscope was then introduced and several small bits of tissue removed from the region of the right antero lateral aspect, also from the left lateral aspect and a good size piece from the anterior margin of the prostatic orifice. Following the operation there was con-

siderable hemorrhage. A retained catheter was fastened in the bladder for several days and the patient was then sent home at the end of six days. The hemorrhage had ceased, but the patient was unable to void except small amounts, and required catheterization. Patient advised to begin dilatations of the urethra.

Sept. 15, '09. The patient still leads a catheteric life, and is unable to void more than small amounts of urine. He is to return for cystoscopy. This case is remarkable in that intraurethral lateral lobules were present, but could not be seen until the median bar was removed, when they protruded through the enlarged prostatic orifice. Such cases are evidently not suited to this instrument.

CASE 7. No. 1272. C. J. A. Aged 58. Patient first consulted me April 3, '06, complaining of frequency of urination which had been present for about two years He said that he was forced to void urine at intervals of 2½ hours and could not go longer except without considerable discomfort, that urination was free and that there was no difficulty in starting the stream and no dribbling at the end and no pain except when he retained urine too long and then it disappeared with urination.

Examination showed that the prostate was fairly soft and not enlarged, but it was adherent on both sides and the seminal vesicles were slightly indurated and adherent. The prostatic secretion contained a few pus cells. Cystoscopic examination showed a definite rounded median elevation of the prostate, 15 cc. residual urine, bladder capacity on forced distention 300 cc., trigone elevated and the bladder slightly trabeculated. The patient was given prostatic massage, irrigations, dilatations and there was at once an improvement in that there was less irritation and patient could retain urine for a longer time. It was found that he had been drinking water in very large amounts and he was advised to reduce the quantity so as not to have to void urine so frequently. During the next two years patient was under treatment for short periods every few months.

On April 30, '09, he returned saying that he was better than

before beginning treatment, but still suffered from undue frequency of urination and that when the desire to urinate would come on it was accompanied by distinct burning and when standing or walking it was very urgent. He now drinks very little fluid, but still has to void at intervals of three hours during the night. There is some hesitation at the beginning of urination and the stream is smaller than normal and two or three attempts are necessary before the act is completed.

The prostate is a little broader than normal, but does not bulge towards the rectum. The seminal vesicles are still slightly indurated and adherent. A catheter passes with ease and finds about 50 cc. residual urine. The patient advised to have the median portion of the prostate excised.

May 5, '09. Operation under local cocaine anesthesia. Excision of the median bar of the prostate with the urethroscopic excisor. Two pieces were removed, one in the median line and the second one slightly to the right of the median line. The first piece was the larger and included the median bar and a little of the urethra immediately in front of it, about 1.5 cm. long and 4 to 8 cm. in diameter.

July 7, '09. The patient writes that he thinks he is cured. Voids urine freely.

Sept. 16, '09. "The bladder trouble eliminated. I drink freely and only urinate every three or four hours."

DISCUSSION

DR. YOUNG in closing. I thank the members for their discussion.

In regard to hemorrhage: There is sometimes a considerable hemorrhage, but never alarming, and even in the worst cases the patients have not shown any effects from it.

Most of these patients have stayed at the hospital over night. Some of them have been done at the office and gone to the hospital and spent the night, others have not.

As to infection, I do not think there is much danger of it. I have used the instrument in seven or eight cases, and there have been no vesical infections.

In conclusion I may say that in this operation we have a simple and I hope radical method of curing these very troublesome cases—characterized by small median bars, unassociated with general prostatic hypertrophy—cases that urgently need relief but for whom a radical prostatectomy has seemed an unjustifiably large operation.

DEMONSTRATION OF PORTABLE GENITO-URINARY EXAMINATION-OPERATION TABLE, AND PRESENTATION OF SOME NEW INSTRUMENTS

By F. Tilden Brown, M. D., of New York.

THIS table is one which was originally devised by one of our colleagues, Dr. Squier. I am sorry he is not here to make comments upon some attachments which I have added. Let us say that Dr. Squier in his original work was aided by the specifications of an engineer who gave the tensile strength of all the parts, and assured him that he could make as light a table as this and yet have it adequate to withstand the strain of an individual weighing at least two hundred pounds.

I will pass these photographs which illustrate it pretty well. We will start with the table in the ordinary position, with the leg rests down, and begin at the details of these leg rests, which are the part I have had most to do with. It is so important in perineal examinations to be able to spread the legs that in devising leg rests it was necessary to have something which would permit of separating the thighs. This was accomplished by this adjustable hinge. Then the thighs must be raised and kept straight when the patient is fully extended on the table for abdominal palpations. When we come to any variety of the lithotomy position we want to have the knees bent over the extension pieces to help in holding the patient in the Trendelenburg position. These leg rests are auxiliary to the work of the shoulder yokes which are attached by this new form of friction lock. These bolts slide with perfect ease and yet when the greatest tension is put upon them they are securely locked. It is very easy if the patient is not quite far enough forward for the anesthetist

to give a shove and for the person at the bottom to pull the patient down, and this yoke holds the patient up closely.

These photographs were made when the table had its original prop for the leg extension. It is there shown as a serrated bar which was intended to catch on this transverse bar, but as the serrations were on each side of the bar they were apt to catch, so we have had them changed to another friction-binding device, which seems to be thoroughly adequate, in the way of this swing eye.

There is hardly anything more for me to say about the table than that I have had put in here these sheathing posts so that we can make use of them for different purposes. The two are combined to carry an irrigator, which can be put on at any place, and at this other end I will put on a thing which I think is of very great importance in cases of kidney operation, and that is an arm crutch. It is of the greatest aid in cases of lateral posture for the patient, where it is otherwise so hard, to keep the patient in the lateral posture on edge without some such prop; but primarily its greatest value is in opening up the chest during anesthetization. There is hardly any posture in which the anesthetist is embarrassed by the patient's respirations as much as in the lateral position in many operations. There the weight is superimposed upon the undermost lung and the dragging of the shoulder and lung upon the super-imposed half of the thorax is very great. Originally patients were so embarrassed in the operation that I had nurses hold their arms at the elbow to keep the shoulder up and to help inspiration that way, and it was so instantaneously relieved in these cases that it seemed to me that it was an unnecessary tax on them.

Another device: The fault which inspired Dr. Morton to improve Dr. Otis's original urethrotome was one which led me to look for something else some years ago, namely, the inaccuracy which I had so frequently seen attending its use, and that was the measuring of the distance of a stricture with bulbous instruments and then transferring that measurement to the urethrotome, resulting almost invariably when the cutting came to be

done in the blade being exposed just anterior to the stricture. I have seen the ablest experts in this line make their measurements, pass in the instrument, make their cut, pass a bulbous bougie and find that they had not cut the stricture. It is quite easy to see how that would happen in transferring measurements, for the reason that when the bulbous bougie is pulled out it draws the stricture nearer the meatus than it really is. Then when the measurement is transferred to the staff of the urethrotome too short a measurement is made, resulting in, as I say, more commonly than not, the blade being exposed anterior to the stricture. In Dr. Morton's instrument I think that this fault has been admirably overcome, and I should say that it transferred the instrument from the criticism of being occasionally as faulty as that, to one of absolute reliability. I think that, rather than rely on the dial, an instrument without the dial, which has a little screw which enables us to turn the cutting part as we wish and a control for opening up the blades and another adjustment for exposing the knife and locking it in place and then by holding the instrument in this way, feeling the stricture you feel that snap, is better.

This instrument has recently had an attachment made for its application to the whalebone guide, which I think is the only thing to rely upon, the French guides being altogether faulty in many cases. Of course, this will not pass through the tightest strictures, but it can be squeezed through many where otherwise we would have to use the Maissonneuve, which is a fiendish instrument in that the hilt at the apex of the blade tears open a groove which is the best sort of a place for faulty urine to lie in.

We can sometimes get into the bladder with a metal catheter when we cannot with a soft catheter, and very often with a sound when we cannot with other instruments, and often when we are in the bladder or in the urethra with a sound we wish that we might be able to carry on some irrigation, or let out residual urine. For that reason I have had made what two or three others have introduced, that is, a catheter sound. This has to be withdrawn only that far when the reflux takes place. This has

a slight lip here so that when it is in at a forty-five degree angle, the tip at the top is used for carrying on irrigations.

A modification of the cystoscope which is not entirely my own but like one of the foreign make whose name I cannot remember, is this, which I call a prostatic catheterizing cystoscope, where in order to get more directly over the ureters, and to get a sharp angling of the catheters with the strongest possible light, we have adopted the backward position of the lamp and immediately in front of it is the position of the catheter control.

On the subject of endoscopes, somewhat like that just shown by Dr. Young, but not having as efficient a line of introduction for medication, is this amplifying lens with a tubular expansion which enables us to make deposits of applications through the syringe immediately upon any lesions seen at the end of the urethra. This has a very thin inner tube which carries a lamp with a screw in it. And this urethroscope for posterior urethral work serves admirably. It is introduced with the obturator, and on its removal this air occluding lens replaces it.

DISCUSSION

DR. YOUNG. I want to congratulate Dr. Brown on his remarkable ingenuity and mechanical ability. There are all sorts of things about this table that are revolutionary. The way in which he gets these shoulder pieces to hold, and the way those leg supporters hold without any screws and without any cumbersome apparatus is really wonderful, and I think this table is a marvel of skill and ingenuity.

In regard to those other instruments, I really have not seen enough of them to say, but they also look very ingenious.

ATTACHMENT FOR MAISSONNEUVE URETHROTOME.

By JOHN H. CUNNINGHAM, JR., M. D., of Boston.

I SIMPLY want to show a little attachment which I put on the Maissonneuve urethrotome five years ago and which has overcome two features which may be considered objectionable in the old instrument. In the first place, the

idea of this attachment was suggested by the frequency with which I had seen men cut their fingers with the old instrument. The second objectionable feature of the old instrument is that the assistant very often failed to hold the organ in a proper position while the cut was being made. The device consists of a shoulder with a bridge through which the knife is introduced, thus avoiding any chance of cutting one's fingers during the introduction of the knife. The other point, holding the penis in the proper position, is made possible by a small shelf upon which the thumb rests, and the head of the organ, being grasped by the two fingers laterally, is forced against it, so that the operator, without the aid of an assistant, has under control with one hand the organ and the instrument.

DISCUSSION

DR. BROWN. I think those instruments brought before us by Dr. Young will prove to be of inestimable value in the cases he has mentioned.

DR. L. BOLTON BANGS of New York. I think Dr. Young has struck an important field. We are all familiar with these cases, and in what I might term the olden time we used to cut them through an opening in the perineum. There are some points I would like to know a little more about. He has admitted there is hemorrhage. I would like to know whether in any of the cases there is serious hemorrhage. I would like to know also as to the question of infection, how it shall be prevented. That is one of the old difficulties with which we used to contend, and it was also one of the arguments made use of against the Bottini. Then the question of the durability of the advantage gained for the patient naturally presents itself.

DR. FRANCIS R. HAGNER of Washington, D. C. I think in these cases that Dr. Young operates on if the trouble persists they can be done again, the same as in the Bottini operation, although it seems to me that doing it under the guidance of the eye is very important. Another point is that it is these cases that have a little bar there that are the most apt to have dribbling after operation. That has been my experience. It may be a little old-fashioned, but I do not believe in operating on patients and letting them go home. I believe that after any operation, no matter how

slight it is, it is safer to keep the patient in bed for twenty-four hours. and I always do so myself. I believe that men are going to have accidents from allowing the patients to go home so soon. It seems to me it is about time somebody gave a word of warning. We know that patients sometimes die after very slight operations. Whether they have an infantile thymus or not I do not know, but they die just the same. Somebody is going to lose a case like that.

I want to say a word about the use of ointments in the posterior urethra. A few years ago Dr. Young presented a rather ingenious instrument for that, and I have used it on several cases. I have not used it recently. I had occasion once to cystoscope one of these patients nearly a year after I had put ointment in his posterior urethra, and the ointment was still in his bladder.

Dr. George K. Swinburne of New York. I have been using Goldschmidt's instrument considerably during the past year. There is no question that though it distorts the object looked at, it is of some value, but I must say that, although I have used it in a large number of cases, with the exception of examining the neck of the bladder itself, that is, the internal meatus, I have never been able to find any lesion that I could not find with my own instrument. As far as making applications is concerned, when you make applications to the posterior urethra you want to make strong ones, and you have got to make them on a swab, it seems to me. I have been using the Goldschmidt in connection with irrigation of the posterior urethra, and I have medicated my fluid, but I have not wanted to use nitrate of silver for fear it would affect the instrument. I use silbamine, a fluoride of silver, in hot, fairly strong solution, as strong as I think the patient will stand, running it with the syringe through the Goldschmidt instrument while I am examining the posterior urethra. I have found it of considerable value in cases in which I do not want to use a strong nitrate of silver solution in the posterior urethra.

Dr. Young. I want to congratulate Dr. Brown on his remarkable ingenuity and mechanical ability. There are all sorts of things about this table that are revolutionary. The way in which he gets these shoulder pieces to hold, and the way those leg supporters hold without any screws and without any cumbersome apparatus is really wonderful, and I think this table is a marvel of skill and ingenuity.

In regard to those other instruments, I really have not seen enough of them to say, but they also look very ingenious.

Dr. L. Bolton Bangs of New York. We found Dr. Squier's table

very convenient and serviceable. It was easy to carry and adapted to almost any operation, but I can see that these additions of Dr. Brown are very useful. How much it adds to the weight to be transported is another question. That, under certain circumstances, need not make any difference at all.

DR. YOUNG in closing. I thank the members for their discussion. In regard to hemorrhage: There is some considerable hemorrhage, and to a person who had not been used to see a good deal of blood, I suppose it would be in some cases rather alarming, but even in the worst cases the patients have not shown any effects of it at all.

As to keeping the patient in bed over night, I think that is perfectly justifiable. Most of these cases have stayed at the hospital over night. Some of them have been done at the office and gone to the hospital and spent the night. Some other cases have not.

As to infection, I do not think that amounts to much. In seven or eight cases, there has been no infection at all.

I really think we have here a perfectly easy way of dealing with this troublesome class of cases, in which you do not want to do a radical operation, and in which the patients are distinctly uncomfortable, and go around from physician to physician hoping to get relief.

Theses Presented by Candidates for Admission to the American Association of Genito-Urinary Surgeons, 1909

SUPPURATIVE PERICYSTITIS

By Arthur L. Chute, M. D., of Boston.

In April, 1908, I removed two calculi, presumably phosphatic, from the left kidney of a man thirty-seven years old. He had been refused life insurance five years before because of the condition of his urine. More recently he had had attacks of vomiting that had been unattended with oedema. He had never had any venereal trouble.

When I saw this man he was very pale and pasty and looked "renal." He was passing about fifty ounces of pale, turbid urine, having a specific gravity of 1008. This urine contained a large trace of albumin and was deficient in urea (76%). The sediment, which was abundant, was mostly pus but contained a few casts; it also contained two different varieties of organisms, a large bacillus and a small coccus, the latter in small numbers. Tubercule bacilli could not be demonstrated either in stained specimens of the sediment or by means of guinea pig inoculations.

Examination of his bladder showed a chronic cystitis. The right ureter gave on catheterization a non-infected urine that

contained a few leucocytes, the left a urine that contained much pus and many organisms. A radiograph showed the presence of calculi in the left kidney.

After his nephro-lithotomy this patient made a slow recovery. He had occasional attacks of vomiting and his urine continued turbid—it was at times very foul. During his convalescence he developed a bronchitis and also a mild pleurisy, but, in spite of these complications, his lumbar wound closed about the thirtieth day. Four or five days later (May 16th) he was allowed to go home. Between the time his sinus closed and the time he went home his evening temperature, which had been normal, went to 100° on two occasions. During these days he also complained of bladder irritability, but I could see no definite cause for this and considered it some unimportant recrudescence of his cystitis.

On May 20th, four days after he reached home, his loin sinus opened and discharged a little urine. He complained of painful and frequent, as well as of difficult urination, though his urine was less foul than it had been. He complained of some pain over his bladder and of considerable pain in his rectum. There was suprapubic tenderness and his prostate seemed larger and more tender than normal. He had a moderate temperature. I believed the man had a lighting up of his cystitis accompanied by an acute prostatitis, and advised palliative treatment. The patient's condition kept on much as above, the temperature varying from 100.5—103 until May 23rd. I had the feeling that I had to deal with what would prove to be a prostatic abscess and would probably open spontaneously into the urethra or rectum. On May 23rd, in addition to his frequent and painful urination, rectal pain, temperature and suprapubic tenderness he developed hiccough that was difficult to control. Besides suprapubic tenderness he now showed a definite mass above the pubes, that corresponded in contour and location with a distended bladder. A catheter showed that his bladder was not full, though micturition was incessant, difficult and painful. There was by rectum a tender mass that I still believed to be prostate.

The next two days were attended with less pain and his general condition seemed to improve somewhat. Up to this time the patient did not have the appearance of being a particularly sick man and I had entertained no question as to the outcome of his trouble.

On the 26th of May this man had the appearance of being decidedly ill. An examination under ether, at which time Dr. Lund saw the patient with me, showed two fluctuant points that proved to be not in the prostate but above and below it, the prostate itself being uninvolved. The bladder was indurated and had the feeling of being a much thickened distended bladder. It was not until this time that the true significance of the condition became evident. Before this I had supposed that I had to do with two coexisting conditions, a developing prostatic abscess and a very acute lighting up of a chronic cystitis.

The fluctuating points were opened and a considerable amount of foul pus evacuated. Tubes were inserted into the abscess cavities and though there was considerable drainage through these tubes the mass above the pubes was unaffected. The patient failed steadily and died thirty-six hours after operation. There was no autopsy.

This case illustrates one of the rather unusual types of bladder disease—unusual enough to be commonly overlooked at first, and to be considered either as an inflammation of the prostate or a very acute cystitis.

Englisch in 1889 took up the question of suppurative pericystitis in a classic monograph that he wrote on inflammations of the space of Retzius. He treated the subject with such thoroughness that I think no really new facts have been contributed since that time.

In this type of disease an infection followed by suppuration takes place in the zone of loose tissue surrounding the bladder. This condition has been callled by various names. Suppurative pericystitis, suppuration of the prevesical space and phlegmon of the space of Retzius are the names most commonly used.

This type of disease is much more common in males than in

females. It has been noticed from infancy to old age, but is relatively rare in the young.

As has been said, these suppurations follow an infection of the loose pericystic tissue. Most instances of infection and infiltration of the pericystic tissue do not terminate in suppuration, but in resolution. Examples of these infiltrations of the space of Retzius that do not go on to suppuration are reported by Englisch, Hitchcock, Necker, Bierhoff, Thiem and others. The proportion of cases in which suppuration takes place in infections of the prevesical space is probably small. I have only recently had under my care a man who, following prostatectomy, developed what I believed to be an infection and infiltration of the space of Retzius. The process did not go on to suppuration but slowly resolved, and that, I believe, is the rule with these infections.

There are a certain number of infections of the pericystic tissue that are tuberculous. They are less common than the non-tuberculous infections, and have been well described by Misiewicz. They do not come into consideration in connection with the reported case, and I shall make no further mention of them.

The non-tuberculous infections of the prevesical space may come about in a variety of ways. There are infections that take their origin from lesions of the urinary tract, either by direct extension (Hallé), or by way of the lymphatics (Imbert). There are other cases in which some traumatism seems to play a part in bringing about the infection (Englisch). In some cases the infection extends by continuity, or by the lymphatics from foci of disease situated in the vicinity of the bladder; sometimes in the abdominal cavity, sometimes in the pelvis (Michels, Brun, Blondel). In a considerable proportion of these cases of suppurative pericystitis the infection is presumably brought by the blood stream (Englisch and Pauzat). In some of these blood stream infections the focus from which the infection comes is perfectly evident, in others it is not.

The numerous causes of suppurative pericystitis have led some writers, notably Englisch, to divide the cases into a considerable number of classes. Thus in the article just mentioned the inflammations of the prevesical space are divided into the idiopathic, traumatic, metastatic and symptomatic. I do not see that such an elaborate classification is of any particular advantage and would suggest that the division into processes of urinary origin and those of non-urinary origin would be much simpler and probably quite as valuable. Hallé has suggested that the cases of pericystitis as a whole, not the suppurative type in particular, be divided into the "true" and the "false"; that one base this division on whether the bladder was or was not the source of the infection.

The pericystic infections that are of urinary origin naturally have the greatest interest for us. It is said of these urinary infections that the prognosis is worse than in the cases in which the infection is brought by the blood stream. The reasons given for this are these: there is usually a large supply of infecting organisms, the patient's resistance is often reduced owing to a long and debilitating illness, not infrequently there may be a co-existing pyelo-nephritis due also to extension from an infected bladder.

Infection of practically any part of the lower genito-urinary tract may lead to this infection of the prevesical space. It has even followed an ulcerated wart on the glans (Imbert). It has followed various sorts of lesions of the urethra, but more particularly urethritis and stricture (Englisch, Meignant). According to Imbert the glands in the prevesical space are in intimate connection with the lymphatics that drain the lower urinary tract. It is said, but I believe that it is based largely on theoretical grounds, that a focus in the prostate is less likely to lead to an infection of the space of Retzius, than a suppuration in the other parts of the lower urinary tract. The reason given for this is the dense fibrous coverings of the prostate.

The bladder has been rather the favorite starting point for

these infections. It has been suggested that infections of the surface of the bladder have two ways of getting into the prevesical space: by the lymphatics at times (Imbert), but most often simply by the infection extending directly through the bladder wall into the loose pericystic layer (Hallé).

These suppurations seem to begin by preference in the prevesical space just behind the pubes. The prevesical space, or space of Retzius, is a layer of loose tissue that almost surrounds the bladder. Its function is to allow the increase and diminution in size of the bladder. It is a potential or possible space, and becomes a real space only under pathological conditions—when the loose tissue is destroyed by suppuration and the cavity filled with pus.

This beginning just behind the pubes seems to be the rule in the cases in which the infection is by means of the lymphatics, also in those in which the infection is by the blood stream. When, on the other hand, the infection extends through the bladder wall, directly, it may reach the pericystic layer of tissue at any point. Even in this last condition the extension to the region behind the pubes is usually rapid. Occasionally, as in the case I have reported, the suppurative process may appear to be most marked and most advanced at the bladder base.

When a suppuration beginning behind the pubes goes on to involve the loose tissue at the base of the bladder, it is probable that the extension takes place along the anterior wall of the bladder rather than along the posterior wall. Englisch believes that in those instances where the suppuration reaches the bladder base it extends between the bladder and the pubes, passing on either side of the prostate. It is his opinion that what he calls the " ligamenta vesico-umbilicalia " offer a considerable opposition to the spread of the suppuration posteriorly. I have nothing to offer either to substantiate or refute this view.

In cases where the suppuration is extensive the bladder may be nearly surrounded by a sac of pus, that has replaced the prevesical areolar tissue. In more extreme instances the suppura-

tion may involve the whole iliac fossa (Pauzat) and even dissect up behind the peritoneum as far as the kidneys (Englisch).

The symptoms of this condition depend to a considerable degree upon the cause of the suppuration. All cases practically present a temperature and the other signs of an infection. Usually the signs are those of an infection of moderate severity, but sometimes the signs are those of a pretty marked sepsis, as shown by chills, sweats, diarrhœa and delirium. There is suprapubic pain that varies much in degree, and tenderness over the pubes. There is usually marked disturbance of urination and in the cases of urinary origin the urine itself shows changes. In the cases that are of non-urinary origin, urination is usually disturbed though the urine itself may show no changes. Rarely both the urine and the function of urination are normal.

In cases such as Michels and Brun have reported, cases in which the suppuration spread to the prevesical space from a neighboring intra-abdominal focus, the early symptoms have naturally been those of the original trouble and have differed materially from the symptoms shown by cases that have been of urinary origin.

The hematogenous infections are often puzzling. For a time they may present simply suprapubic pain and tenderness with frequent and painful urination, and sometimes with a normal urine. When the urine is perfectly normal, as has been the case in some of these blood stream infections, it is almost impossible to make a diagnosis before the appearance of the mass above the pubes. Suprapubic pain and tenderness are usually the first local signs of a pericystic inflammation. The suprapubic mass makes it appearance shortly after, though at times this may come only after an interval of some days. The more acute the process the earlier this mass appears. This mass can usually be felt very plainly above the pubes, but bi-manual palpation may show it even more distinctly.

The appearance of a mass above the pubes is practically the point upon which one depends in nearly all cases for establishing

a diagnosis. It should perhaps be possible in some of the cases that begin in the pericystic tissue at the side or near the base of the bladder, to recognize the condition from the areas of induration or fluctuation that are to be felt by rectum. There will usually, however, be an uncertainty about the significance of these masses that does not exist with the suprapubic mass. The mass felt above the pubes has the feeling, if palpated casually, of a distended bladder. When examined more carefully it may show a slightly uneven surface, due to the slightly lobulated condition of the tissue of the prevesical space. It will be seen also that the mass broadens, or tends to broaden, just above the pubes, in a way that a distended bladder does not do. The passage of a catheter and the finding that emptying the bladder makes no change in the mass, is the crucial test in distinguishing between a full bladder and a pericystic infiltration. Some writers have likened the mass felt in these prevesical indurations to that of a pregnant uterus.

When a suppurative pericystitis is of urinary origin it should be possible to recognize it more readily than when it is not of this origin. It may be possible, perhaps, to recognize it even before there is a marked suprapubic induration. It has been said that when a temperature appears without evident cause in a chronic bladder infection, we may feel sure that one of two things has taken place, the infection has extended either to a kidney pelvis, or to the prevesical space. While a suprapubic mass, such as I have described, is pathognomonic of a pericystic infiltration, it is not necessarily so of a pericystic suppuration. Where there is an extension from the main suprapubic mass up toward the umbilicus, along the course of the obliterated hypogastric vessels and urachus, it is pretty definite proof that suppuration has taken place. The presence of suppuration is evident when there is fluctuation, but fluctuation, though sometimes seen, is not common in this condition. When the skin is red and adherent one is of course sure that suppuration exists. The pres-

ence of a considerable leucocytosis should be a help in differentiating between an infiltration and suppuration of the prevesical tissue, as should chills or an irregular temperature. In some cases, as in mine, there may be fluctuant points to be felt by rectum; in others one may have to use an exploring needle to determine the presence or absence of pus. It is probably better to make an incision into the prevesical space in cases where doubt exists, rather than to wait an unduly long time to demonstrate definitely the presence of pus.

Besides the definite points of infiltration that one may feel by rectum, there may be masses of infiltrated tissue or a thickening of the bladder base. It has been a common mistake to consider the infiltrations and fluctuant points that are felt by rectum, as having to do with the prostate, rather than with the pericystic tissue. I believe this error is avoidable if one bears in mind the possibility of these pericystic inflammations giving rise to masses that may be felt by rectum.

In arriving at a diagnosis one may have to consider a considerable number of conditions, some of which I will mention briefly. Suppurations in the sheath of the rectus muscle are usually confined to one side, which is not the case in suppurative pericystitis. Suppuration of the pyramidalis muscle is ordinarily of bony origin and usually confined to the sheath of the muscle. Suppuration of the sub-peritoneal tissue is more superficial and more diffuse than what we see in the pericystic suppurations.

Cases of pelvic peritonitis may usually be distinguished by the history and the fact that the pain and tenderness are not localized just above the pubes. In some instances a suppurative pericystitis has followed upon a pelvic inflammation. Retention of urine is ruled out by the fact that the mass above the pubes does not disappear when the bladder has been emptied by a catheter. It may be difficult to rule out acute prostatitis at the onset, but it should be easy to do so as soon as the suprapubic mass makes it appearance.

New growths do not, as a rule, have a temperature. A diverticulum on the anterior bladder wall can be easily ruled out by a cystoscopic examination.

The prognosis in the cases of urinary origin is, as I have said, supposed to be somewhat less good than the prognosis in the cases that are not of urinary origin. This better prognosis of the non-urinary cases applies only, I believe, to the cases in which the infection is by the blood stream. The prognosis of the cases that are secondary to some neighboring abdominal lesion naturally depends largely on the nature of the primary process, and will be very grave in a considerable proportion of cases. Thus in one case cited by Michels a cancerous coil of intestine adhering to the bladder had caused the pericystic suppuration; in one Brun cited, an appendix abscess had infected the prevesical tissue. Both of these cases were fatal.

There have been a considerable number of cases in which recovery has come about without any surgical intervention. In such cases the pus collection has opened spontaneously. Above the pubes and in the region of the umbilicus have been the favorite places, while in other instances the pus has been discharged into the bladder, rectum or vagina.

Because induration of the prevesical space very closely resembles suppuration as shown by the number of instances in which an incision has shown no pus, it is impossible to be sure that pus was present except in cases in which it was demonstrated either by operation or by spontaneous rupture.

In the cases that terminate fatally the fatal outcome in a considerable proportion of the cases is the result of pus breaking into the peritoneal cavity and setting up a generalized peritonitis. In a lesser number it is due to septic absorption from the abscess cavity.

In the matter of treatment I believe but one thing can be advised, that the collection of pus be drained and as early as possible. The incision should, by preference, be just above the pubes and be carried well down into the pericystic tissue. Should there be fluctuant areas to be felt by rectum they should be

drained. In a case such as the one I have reported, where there were foci to be felt by rectum, it is a question whether in addition to opening these one should not also make a suprapubic opening. Though in the reported case drainage was profuse it is doubtful if it was adequate.

Though Meignant, Pauzat, Lang, Pasteau and many others report cases that have recovered after operation, yet the number of reported cases is too small to allow one to compile useful statistics.

Conclusions:

Suppurative pericystitis is a somewhat uncommon condition in which suppuration takes place in the zone of loose tissue about the bladder, and in which either a part or the whole of the space of Retzius becomes a veritable abscess cavity.

In a large proportion of cases the infection is secondary to some disease of the lower urinary tract. The infection of the prevesical space takes place by direct extension, or through the lymphatics. In a considerable number of cases of suppurative pericystitis the infection is through the blood stream and may come from a focus existing in practically any part of the body. In some instances the disease is an extension from a neighboring intra-abdominal or intra-pelvic lesion.

The characteristic thing diagnostically is the presence of a mass above the pubes that more or less closely resembles a full bladder but is unaffected by passing a catheter.

The disease is one that will probably always have a considerable mortality. The disease is of a secondary character and its mortality will depend largely upon the nature of the disease that it is secondary to. The treatment should be free drainage of the pus collection.

Englisch: Ueber die idiopathische Entzündung des Zellgewebes des Cavum Retzii.
Wiener Klinik, 1889, vol. XV, p. 1.

Hitchcock: Chronic perivesical inflammation.
Annals of Surgery, 1896, Vol. XXIII, p. 140.

Necker: Chronische sklerosierende Parazystitis; paravesikale Holzphlegmone.
Wiener, klin. Woch., 1907, Vol. XX, p. 1218.

Bierhoff: Notes on Pericystitis.
American Journal of Urology, 1904, Vol. I, p. 59.
Thiem: Ueber Paracystitis, etc.
Fravenärzwt, Berlin, 1886, p. 312.
Misiewicz: Beitrag zur Anatomie du Pericystitis.
Centralbl. f. d. Krankh. d. Harn. v. Sex.-Organe, 1897, Vol. VIII, p. 178.
Hallé: Des péricystites.
Ann. d. mal. d. org.-génito-urin., 1892, Vol. X, p. 813.
Imbert. Note sur la pathogenie des phlegmons def la cavité de Retzius.
Tr. Assoc. franç d'urol, 1902-1903, Vol. V., p. 555.
Michels: On prevesical abscess.
Med. Chir. Tr., London, 1896, Vol. LXXIX, p. 63.
Brun: Abscès de la cavité de Retzius par appendicite.
Presse méd., Paris, 1896, p. 341.
Blondel: Abcès sous-vésical et phlegmon du ligament large.
Gynécologie, Paris, 1904, Vol. IX, p. 306.
Pauzatz: Contribution a l'étude de la région prévésicale, etc.
Gazette Médicale de Paris, 1880, Vol. II, p. 448.
Meignant: Contribution à l'étude des péricystites suppurées.
Thèse, Paris, 1895.
Lang: Periuréthrale und pericystische septische Phlegmon.
Jahrb. d. Wien. k. k. Krankenh., 1896 Wien und Leipzig, 1898, V. Pt. II, p. 86.
Pasteau: Pericystite suprée guérie, etc.
Ann. d. mal. d. org. génito-urin., Paris, 1897, Vol. XV., p. 282.

REBELLIOUS BACTERIURIA

By JOHN T. GERAGHTY, M. D.

BACTERIURIA is a condition which was first described in 1881 by Roberts.[1] He reported a case in which his attention was attracted by the appearance of the freshly voided urine. This presented a peculiar opalescence and exhaled a disagreeable odor. On microscopic examination the peculiar appearance was found to be due entirely to the presence of enormous numbers of bacteria both cocci and bacilli. A few years later a case was reported by Schottelius and Reinhold,[2] and in 1888 a work of Ultzman[3] was published in which a chapter was devoted to bacteriuria.

Increasing numbers of observations have been reported and the condition studied by many workers particularly Rovsing,[4] Krogius[5] and Janet.[6] To-day bacteriuria is a well recognized affection and one not infrequently encountered, and is without

doubt often mistaken for mild cystitis. The bacteriuria occurring during or following typhoid fever and due to the bacillus typhosus is a form of the disease long recognized and one with which the profession is most familiar.

Bacteriuria is really a remarkable condition, and one at first sight difficult to understand, for it apparently upsets our ideas of bacterial invasion which are generally associated with inflammatory phenomena. It is difficult to reconcile the presence of enormous numbers of bacteria in the bladder urine persisting for months and even years without causing an inflammatory reaction on the part of the vesical mucosa.

There is some difference of opinion regarding the application of the term. Predohl[7] would limit its application to those cases in which a healthy individual without any clinical evidence of inflammation in the urinary tract and without recognizable cause voids urine which contains in its fresh state bacteria. He would not include those cases in which a previous inflammation or diseased focus existed. According to Krogius the condition is characterized by the presence of enormous numbers of bacteria in the freshly voided urine and by the absence of any pronounced symptoms of inflammation of the urinary tract. He does not believe the term should be applied to cases in which it is a phenomenon secondary to an infectious nephritis or part of a general infection. Rovsing distinguishes two types of cases, one in which the urine is absolutely free from pus, and another in which a few pus cells are present, but the peculiar cloudiness of the urine is due to bacteria. In his opinion it is most infrequently of renal origin.

Bacteriuria in reality represents an infection different only in degree from ordinary cystitis. In one the infection is present without any inflammatory reaction on the part of the bladder wall, while in the other we have the infecting agent in the urine plus involvement of the vesical mucosa. As a rule the disease is one which yields readily to treatment, but occasionally it may be most intractable and resist all efforts to dislodge the invading organisms. The series of cases reported below are of the in-

tractable type and incurable as far as all our efforts have been concerned. In two cases the bacteriuria was of renal origin, and in two cases secondary to an infection of the prostatic urethra, prostate and seminal vesicles.

CASE 1. Alkaline bacteriuria of renal origin. Chronic prostatis. Intermittent phosphaturia. Organism, staphylococcus albus.

R. M., aged twenty-seven. Single. He was seen for the first time in September, 1907, complaining of cloudy urine and intermittent attacks of burning in the urethra and frequency of urination. Six years previously he had contracted gonorrhœa following which he had a discharge which persisted for some months, but finally ceased without any special treatment. Seven years ago he had a sore on his penis but this was not followed by any secondaries. Four years ago he noticed that his urine had become cloudy but this was attended with no special symptoms at that time. This cloudiness of the urine has been persistent and at intervals he has suffered from slight attacks of frequency and severe burning in the urethra on urination. During these exacerbations considerable quantities of a white sand-like substance have always been passed. In the interval between these attacks when this white sand-like material is not excreted he is comfortable, and entirely free from symptoms. The general nutrition has always been maintained and he has never had any pain in the region of the kidneys or along the course of the ureters. He was first seen during one of these attacks above noted. On physical examination his chest and abdomen were normal. There was no tenderness over the kidneys or ureters. The urine when voided in three glasses was quite cloudy in all of them and a white granular sediment settled to the bottom. The urine was slightly but definitely alkaline and negative for albumin and sugar. The addition of acetic acid caused some slight clearing of the urine, but it still remained definitely hazy. The microscopic examination of the precipitate which was composed of small whitish granular masses showed that it was a mixture of amorphous and triple phosphates with large masses of a gram staining coccus.

With the exception of the first glass which contained a few pus cells the urine was entirely free from pus.

Cystoscopic examination of the bladder showed no signs of inflammation, the mucosa being perfectly normal.

On rectal examination the prostate was slightly enlarged and somewhat indurated in areas, while the prostatic secretion contained a fair number of pus cells, but also numerous normal elements. The seminal vesicles were small and soft. He was instructed to drink large quantities of water and was given thirty grains of urotropin a day. Within a short time the phosphaturia disappeared, but a distinct haziness of the urine still remained. It was then decided to catheterize both ureters to determine if the organisms were not being excreted from the kidneys. Catheters were introduced about 4 cm. on each side, and the first 5 cc. collected was discarded. About 10 cc. were then collected from each ureter. The urine from both ureters was apparently clear with the exception of small floating particles. On being centrifuged and examined microscopically it was found that these small grayish masses were clumps of cocci, but no leucocytes were observed. The same condition was present in the urine from both kidneys and the reaction of each was slightly acid. Cultures from each catheterized specimen, as well as from the bladder urine, showed a pure growth of staphylococcus albus. Urotropin was then increased to sixty grains a day, and for a short time the urine became almost entirely clear, but the cloudiness soon recurred notwithstanding the large doses of urotropin. Subsequently both ureters were catheterized and the pelvis of each kidney was washed with a 1% solution of protargol. This procedure was repeated several times at weekly intervals, but as no improvement was noted following pelvic lavage it was discontinued. In January, 1908, the staphylococcus albus was again isolated from the urine in pure culture and a vaccine prepared. The vaccine was made from an 18 hour agar culture. He has been given weekly injections of 200 to 400 million organisms during a period of three months, but the vaccine has apparently not had the slightest effect. At the present time the infection is

still present. While taking urotropin he is comfortable and free from phosphaturia, but on discontinuing it for any length of time the phosphaturia returns with its uncomfortable symptoms.

CASE 2. Acid bacteriuria of renal origin. Acute locomotor ataxia. Organism, B. coli communis. P. S., aged twenty-four. Married.

He was first seen in August, 1907, complaining of slight pain on urination, some frequency and considerable difficulty in starting the flow. He gives a history of gonorrhœa six years ago which was of short duration. About three years ago he had a sore on the penis, but this was not followed by any secondaries and he has never taken any treatment for syphilis. One year ago, however, he began to develop symptoms of locomotor ataxia and this has developed very rapidly until at present he is hardly able to walk. Six months previously he had an attack of dysentery which lasted five weeks and during this attack noticed for the first time cloudiness of the urine together with some pain and frequency. For almost a year he has had more or less difficulty in starting the flow, due unquestionably to his locomotor ataxia.

Examination: Patient is a frail, sickly looking young man with well developed signs of locomotor ataxia. Chest and abdomen negative. No tenderness or pain over kidneys. External genitalia normal.

On rectal examination the prostate was small, soft and apparently about normal. Microscopically the prostatic secretion showed a few pus cells, but for the most part it was composed of normal elements. The urine voided in three glasses had a peculiar haziness characteristic of bacteriuria. Microscopic examination showed a few pus cells in the first glass, while the last glass contained no pus cells, but an enormous number of gram negative bacilli. The urine was acid and contained no sugar or albumin. The urethra was negative for stricture and inflammatory indurations. A catheter was readily passed and withdrew no residual urine and the bladder capacity was normal. Careful inspection of the bladder mucosa through the cystoscope revealed nothing abnormal and with the exception of a slight

reddening about both ureteral orifices the examination was negative. He was instructed to drink large quantities of water, to take 40 grains of urotropin a day and was given daily intravesical irrigations of bichloride 1 to 60,000. The pain and frequency of urination almost immediately disappeared and there was distinct but not entire clearing of the urine. As long as the above treatment was continued the urine remained comparatively clear, but on discontinuing urotropin and water it promptly returned to its first condition. It was finally decided to catheterize the ureters, and catheters were introduced about 4 cm. on each side. The right ureter functionated copiously, but for some reason or other only a few cc. were obtained from the left side during a period of fifteen minutes. During this period about 20 cc. were collected from the right ureter, the first 5 cc. being discarded and only the last portion saved for examination. This last portion of urine was apparently clear to the naked eye, but numerous small particles could be seen. On microscopic examination, however, these small masses were found to be clumps of bacilli, a condition similar to Case 1. As only a few cc. had been collected from the left ureter microscopic study was not considered of any value on account of the probability of the first portion containing bacteria from the end of the catheter, which had necessarily come in contact with the vesical mucosa. A culture from the urine gave a pure growth of coli communis. A vaccine was then prepared from an 18 agar culture of his own organism and the urotropin was discontinued. Injections of 100 to 200 million bacilli were then given subcutaneously in the upper arm at weekly intervals. The injections have caused no local nor systemic reaction. He has received up to the present time eight injections, and during the last month a decided and progressive improvement has taken place. At present although taking no urotropin the urine is comparatively clear, but microscopic examination still shows the presence of bacilli.

CASE 3. Bacteriuria secondary to posterior urethritis and chronic prostatis. Organisms, staphylococcus albus and bacillus coli communis. A. M., aged thirty-two. Single.

He was seen for the first time in July, 1907, complaining of a "bearing down pain" in the rectum, and an aching at the neck of the bladder a few minutes after urination. He contracted gonorrhœa for the first time ten years ago and since then has had the disease several times, the last attack being three years ago. During one attack five years ago he developed a swelling of the right epididymis. Two years ago he contracted syphilis for which he has conscientiously taken treatment. His present symptoms date back eight years and have been much more severe than at present. He gets up once or twice at night to void and urinates during the day about every three hours. He has no hesitation or difficulty in voiding and his stream is full and large. Sexual powers are good, but ejaculation is precocious. The ache at the neck of the bladder soon after voiding and the "bearing down pain" in the rectum were the only symptoms for which he sought relief.

Examination: Patient was a rather neurotic loooking man, but in good physical condition. His chest and abdomen were negative. The external genitalia were normal and there was no urethral discharge. The urine when voided in three glasses showed slight cloudiness in the first glass, while the second and third glasses were clear.

On rectal examination the prostate was somewhat enlarged and the consistency of the gland as a whole was quite firm. The surface was rather smooth. There were no periprostatic adhesions. The prostatic secretion was rather scanty and almost entirely composed of pus cells.

He was treated by prostatic massage, dilatations of the posterior urethra, etc., for several weeks when it was noted that the urine had become slightly hazy, but no urinary irritability had appeared. Microscopic examination showed that the cloudiness was due to a coccus. Large doses of urotropin were immediately ordered, but had only a partial effect upon the cocciuria. Cultures from the urine gave a pure growth of staphylococcus albus.

The bladder upon cystoscopic examination appeared per-

fectly normal. This condition of the urine persisted unchanged for several months, the reaction varying somewhat from a slightly acid to a slightly alkaline condition without the formation of any phosphatic deposits. The urine, however, on standing became in a few hours strongly alkaline with a heavy precipitation of phosphate. The presence of the infection seemed to produce no special symptom.

A few months later a secondary invasion with a bacillus was noted and this in culture proved to be coli communis. The invasion of the colon was productive of no special change except increased cloudiness of urine. Repeated cystoscopic inspection of the mucosa never revealed any evidence of inflammation. Catheterization of both ureters performed while the condition was a pure cocciuria and later after the secondary invasion with the coli communis showed the urine from both kidneys entirely clear and microscopically negative for organisms. Urotropin, instillations of silver nitrate, prostatic massage and vesical irrigations failing to have any effect upon the bacteriuria, vaccines were prepared from his own organisms. He was first given injections of 100 to 300 million staphylococcus albus at weekly intervals during a period of two months without, however, any apparent diminution in the number of staphylococci in the urine. The injections of the staphylococcus vaccine were then discontinued and injections of his own colon bacilli in doses of 100 to 200 million were instituted. He has received so far about five injections, and since the institution of the colon vaccine the number of bacilli has perceptibly decreased in the urine, but no definite conclusion as to the value of this last vaccine can as yet be drawn.

CASE 4. Alkaline bacteriuria. Chronic posterior urethritis, prostatis, and vesiculitis. Phosphaturia. Organism, staphylococcus albus. S. D., aged thirty. Married.

Admitted July, 1907, complaining of pain in the right kidney region and passage of large quantities of sand accompanied by severe burning pain in the urethra. He contracted gonorrhœa about five years ago and had a discharge for one year. He dates

his symptoms to the attack of gonorrhœa five years ago. His urinary symptoms are intermittent, at times he voids at fairly normal intervals and again has attacks when he micturates as often as five to ten times at night and every few minutes to a half hour during the day. During these exacerbations he has noticed that the urine has increased cloudiness and that considerable quantity of sand is passed. He suffers a great deal from a severe aching pain in the perineum and a constant dull ache over the right kidney region. This pain in the kidney region, however, does not radiate and does not simulate renal colic. The general health has remained good although patient states that his sufferings at times are agonizing.

Examination: Patient is a well nourished man. Chest and abdomen are negative. There is no tenderness over either kidney. External genitalia are normal. There is no urethral discharge. The urine when voided in three glasses is cloudy in all three and a considerable white granular precipitate forms. On addition of acetic acid a large part of the cloudiness disappears, but a distinct haziness still persists. Microscopic examination of the first glass shows a few pus cells, while the third glass shows no pus, but enormous numbers of a gram staining coccus. Precipitate is composed of triple phosphates. The reaction of the urine is alkaline and contains no sugar or albumin.

Rectal examination: The prostate is enlarged, indurated and quite nodular. The induration is especially marked at the upper pole and continuous with enlarged and indurated seminal vesicles. The secretion obtained from the prostate and the seminal vesicles shows a large number of pus cells. The urethra is negative for stricture or areas of induration.

The cystoscopic examination shows that the bladder mucosa is entirely normal as is also the prostatic orifice.

Under prostatic massage, dilatations of the posterior urethra, instillations of silver nitrate, large quantities of water and large doses of urotropin, the patient soon showed marked improvement in his symptoms. While taking large doses of urotropin the urine was usually neutral or slightly alkaline and he

was entirely free of the distressing symptoms accompanying the passing of the sand. The bacteriuria persisting despite all treatment the ureters were catheterized, catheters being introduced about 4 cm. on each side, as in the other cases, the first portion of the urine was discarded, and only the last portions collected were saved for examination. The urine from each side was perfectly clear, had a slightly acid reaction and was negative for organisms or pus cells. Cultures which were made from the bladder urine gave a pure growth of staphylococcus albus. A vaccine was prepared from this as in the other cases and doses from 100 to 300 million were given at weekly intervals during a period of three months. The vaccine, however, has proved absolutely valueless up to the present time, the urine being still slightly hazy, but on discontinuing the urotropin the phosphaturia is not so marked. The pains in the kidney region and in the perineum have entirely disappeared, so that although the infection still persists he is comparatively comfortable.

In the four cases reported some variety of the staphylococcus albus was the offending organism in three cases, being once associated with the bacillus coli communis. In one case the bacillus coli communis was found alone. B. coli is apparently the organism which has been found most frequently by the various observers. In the series of cases reported by Rovsing the coli communis was the organism found in every instance. Predohl, as a result of his observations, concluded that bacteriuria was always due to this bacillus. However, bacteriuria due to other organisms particularly varieties of the staphylococcus have been observed; while three of the four cases above reported were due to cocci, all varieties of the staphylococcus albus. It is well known that both the staphylococcus albus and the bacillus coli communis may have little or no pathogenicity, and this will explain to a certain extent their growth and persistence in the urinary tract without producing any inflammatory phenomena. We have never seen a case of bacteriuria due to the more pathogenic organisms such as the staphylococcus pyogenes aureus or any of the proteus group nor have we found any

such cases reported. It is very probable that the more pathogenic organisms when they gain a foothold soon produce a reaction on the part of the tissues and the picture becomes an inflammatory one. Melchior[8] has shown that the mere introduction of the proteus of Heuser is sufficient to set up a violent cystitis.

The route of invasion or the passage way through which organisms gain their entrance to the bladder is essentially the same in cystitis and bacteriuria. When the bacteriuria is persistent it is probably essential to have some focus in the urinary tract or neighboring organs which continually pours bacteria into the bladder urine. In cases where an obstruction is present with residual urine this urine may serve as a culture medium particularly so if it is albuminous. One can readily understand the persistence of the organisms in such cases without any contributing focus. Rovsing has experimentally shown that if a culture of bacteria is introduced into a normal bladder all of the bacteria will be expelled in the course of a few days, so that it would seem necessary in order to explain the persistence of bacteriuria to have some point from which the organisms gain access to the bladder.

In our four cases the condition was of renal origin in two, secondary to chronic posterior urethritis and prostatitis in one, and associated with chronic urethritis, prostatitis and vesiculitis in the other.

In the two cases of renal origin it is probable that a focus of infection of mild grade was present in the superior urinary tract. Just what the nature of the lesion in these cases may be it is impossible to say, as no microscopic study of the renal tissue has been made in cases of this character as far as we have been able to determine. In the cases reported by Krogius and Stenbeck,[9] in which an autopsy had been performed, the bladder and kidneys were said to be normal in appearance, but unfortunately no microscopic examination of the tissues was made. It seems fairly probable that an apparently healthy kidney can excrete organisms picked up from the general circulation, and in this way give rise to a temporary bacilluria. That organisms, however,

in enormous numbers and over a period of months or years could be strained through the kidneys without any focus in the kidney itself is highly improbable.

In the type of cases secondary to infection of the prostatic urethra, prostate and vesicles, the method of invasion of the urine by the organisms is not inexplicable. The bacteria having gained a foothold in the posterior urethra can readily infect the bladder urine from this point. There is without doubt considerable difference between the resistance to infection offered by the bladder and that offered by the posterior urethra. The posterior urethra is a favorable soil for organisms, while the bladder displays enormous powers of resistance. The explanation of this lies partly in the different character of the epithelium which each possesses. It is probable that the squamous type of cell which forms the superficial layer of bladder epithelium is largely responsible for its resistance to infection. In the anatomical structure of the prostate particularly suited for harboring infection, and in the delicate cylindrical epithelium of the posterior urethra we have a combination peculiarly favorable for the maintenance of a bacterial invasion. There is one form of bacteriuria which has been of considerable interest to us and which occurs as a complication of prostatic massage. It is usually a slight affair and yields promptly to treatment, but occasionally such a happy termination of the complication does not occur.

CASE 3 is an unfortunate example of the rebellious character which it may assume. It is impossible to say in any one case whether the organisms travel directly through the rectal wall into the vesical cavity or from the rectum through the lymphatics to the prostate, subsequently infecting the prostatic urethra, or whether organisms already in the prostate are forced by prostatic massage into the prostatic urethra and from this point infect the urine.

In several cases in our experience in which a careful microscopic study of the stained prostatic secretion failed to reveal any organisms, a bacteriuria shortly afterward developed.

Furthermore in a case of nocturnal enuresis in a boy fourteen years of age in whom there was practically no development of the prostate and no sign of inflammation, a mild cystitis developed following a light massage. It is probable in many instances that infection can come directly from the rectal mucosa, possibly the result of some injury to the mucosa or the lymphatics. Wreden[10] considers that direct penetration of bacteria through the mucous layer of the rectum can occur. His opinion is based upon a series of experiments made on male rabbits. He injured the rectal mucosa by means of an irritant or by scraping off the epithelium, and he found that the rectal lesions provoked a cystitis only when the lesion was situated at the level of the prostate or higher. Lesions lower down had no influence. The organisms found in the bladder were those usually present in the intestines. In certain instances easily recognizable bacteria were introduced into the rectum and these were subsequently recovered in the urine. When he introduced oil or vaseline, the rectum having been denuded of its epithelium, these substances were subsequently discovered in the urine. His experiments were not conclusive as to whether the infection was through the medium of the prostate or directly from the rectum to the bladder.

Bacteriological researches of Notthafft[11] (Youngs, Stevens and myself)[12] have shown that occasionally even when the prostatitis is primarily of gonorrhœal origin, secondary invaders may be present in the prostatic secretion. It is not at all improbable that such an infected secretion when forced into the prostatic urethra may be the starting point of a bacteriuria or even cystitis. For this reason vesical irrigations following massage of the prostate is a procedure long recommended and practiced by Dr. Young. As an additional precaution the prostatic secretion should be stained and carefully studied for organisms before systematic massage is done. If secondary invaders are present the patient should be kept upon moderate doses of urotropin while under treatment.

Acid bacteriuria is practically devoid of symptoms. At

times there may be slight burning and frequency of urination due to irritation of the prostatic urethra, but this is seldom of any severity. There is only one thing characteristic of the condition and that is the appearance of the urine. The urine is cloudy, but the cloudiness is similar to that of a bouillon culture. No particles or definite masses are visible as in cystitis or when the turbidity is due to pus. At times it has a peculiar opalescence, no precipitate forms on standing, and when centrifuged in the ordinary way none or little sediment is formed. The usual chemical examinations disclose nothing and it is only on microscopic examination that the true nature of the urinary condition becomes evident. It is then seen that the peculiar character of the urine is due entirely to the presence of enormous numbers of bacteria. In cases of cystitis or pyelitis it is seldom that the fresh urine contains such a myriad of organisms as are seen in bacteriuria. In the first instance the protective forces of the body are brought into play in their fight against the invading organism, inhibiting and reducing their growth, while in the latter instance, not being irritating to the tissues, they grow luxuriantly more in the nature of saprophytes than parasites.

It is rather interesting that in the two cases due to the staphylococcus albus the bacteriuria was alkaline and associated with the presence of large quantities of phosphates. In the third case where the staphylococcus albus was associated with the coli communis the urine usually varied from a slightly acid to a slightly alkaline condition, but on standing, quickly became alkaline with a deposition of a large amount of phosphates. Comparatively few observations of alkaline bacteriuria have been reported and the literature upon this point is rather scanty. Escat [13] has seen two cases both due to staphylococcus, but no cultures were made. His cases are quite similar to ours and the condition had been present for years and resisted all treatment employed. The alkalinity is not due to an augmentation of phosphates in the urine, but probably to a decomposition of the urea by the organisms with the formation of the ammonium carbonate rendering the urine alkaline. This change in the re-

action of the urine results in the precipitation of phosphates. That the alkalinity of the urine was directly due to the action of the micro-organisms seems positive. In the first place the urine obtained from the kidneys was either neutral or slightly acid while the bladder urine was alkaline. Furthermore when the growth of organisms was inhibited by large doses of urotropin the bladder urine became neutral or slightly acid.

In Case III. where both the staphylococcus and colon were present the reaction varied. When microscopic examination showed the staphylococcus in greatest abundance, the urine was alkaline while with an excess of the colon the urine was acid or neutral.

In all of the cases reported in the literature due to the colon bacillus the urine was always said to have been acid. Whether the invading organism is an acidifier or an alkalinizer is of considerable importance to the patient. When the bacteriuria is an acid one, symptoms may be entirely absent or at most of a mild grade while in the alkaline bacteriuria the symptoms resulting from the passage of the phosphatic material may give rise to most distressing symptoms.

Treatment. In most cases of bacteriuria the condition rapidly clears up with the administration of urotropin or even without the institution of any treatment. Where, however, the infection has been present for any length of time the prognosis is distinctly unfavorable. It is first essential to determine, if possible, the focus which is supplying the organisms to the urinary tract, and to direct attention to the elimination of this focus.

Peyer [14] succeeded in curing some cases of rebellious bacteriuria by directing his treatment to an associated vaginitis. In cases secondary to inflammation of neighboring organs, e. g. the prostate, etc., an effort should be made to eradicate this inflammation. Irrigation of the posterior urethra, instillation of silver nitrate, dilatations and prostatic massage may be tried. Although it may not be possible to entirely eradicate the disease, as in the cases which we have cited, much can be done towards decreasing the amount of infection and relieving the symptoms.

In the cases of renal origin very little can be done. Pelvic lavage may be tried. Urotropin, plenty of water and attention to the general nutrition are the measures of most value.

The results of vaccine therapy have been most discouraging. The patient's own organism has been employed in each case and the vaccine has been injected over a period sufficiently long to test its efficiency. In the staphylococcus infection absolutely no effect was produced. The colon vaccine seems to have done some good, but we are not yet prepared to judge of its real value. In conclusion we may say that:

1. Bacteriuria when persistent is always due to organisms of slight pathogenicity.

2. Bacteriuria due to the B. coli produces an acid urine—when due to the staphylococcus albus it may be alkaline and give rise to troublesome phosphaturia.

3. It is secondary to some focus in the urinary tract or neighboring organs.

4. It may persist indefintely despite all treatment without producing any inflammatory reaction on the part of the vesical mucosa.

5. The results of vaccine therapy are entirely negative as far as the staphylococcus is concerned, but possibly of some value against a colon infection.

1. Roberts. The Occurrence of Micro-organisms in Fresh Urine. Brit. Med. Journ., 1881, Vol. II., p. 623.
2. Schottelius and Rheinhold. Ueber Bakteriurie. Centrlbl. f. Klin. Med., 1886, Vol. VII., p. 623.
3. Ultzman (?n). Vorlesungen Ueber die Krankheiten der Harn-Organe. 1888. (Cit. Janet. Ann. des mal. des Organes Gén.-urin., 1903.
4. Rovsing. Die Infektionen der Harn-Organe. 1898.
5. Krogius. Sur la bactériurie. Ann. des Mal. des Org. Gen.-urin., 1894.
6. Janet Entérite et Bactériurie. Ann. des. Mal. des Org. Gén.-urin., 1903 Chronische Urethritis und Baktériurie, Centrlbl. des Harn und Sex. Org., Oct. 1894.
7. Predohl. Bakteriurie. Muench. Med. Wochen., 1899, p. 1495.
8. Melchior. Cit. from Ann. des Mal. des Org. Gén.-urin., 1894.
9. Stenbeck. Zeitschr. f. Klin. Med., 1892, p. 437.
10. Wreden. Zur Aetiologie der Cystitis. Centrlbl. f. Chirurgie., 1893, No. 27.
11. Notthaft. Archiv. f. Derm. u. Syph., 1904.
12. Johns Hopkins Hospital Reports, Vol. 13, 1906.
13. Escat. Quatrième session de l'association Française d'urologie, 1899.
14. Peyer. Zur Bakteriurie. Cit. Ann. des Mal. des Org. Gén.-urin., 1890. Zuelzer Centrlbl. Erst. Bd., 1890.

NECROSIS OF THE BLADDER WITH EXFOLIATION. A CONSIDERATION OF THE SUBJECT, WITH TWO PREVIOUSLY UNREPORTED CASES

TABLE OF REPORTED CASES. TWO PHOTOGRAPHS.

By RICHARD F. O'NEIL, M. D., of Boston.

THE writer having had the opportunity during the last few months to observe two cases of this extremely interesting and fortunately very uncommon condition, trusts that a brief presentation of the subject will be of interest.

I will give the course and clinical histories of the two cases before taking up the different aspects of the subject in general. These two cases are very similar and are good examples of a certain type of the lesion.

CASE 1. Thirty-three years of age, primipara. Previous and family history negative. On March 18th, 1906, she had a long, hard labor with a difficult high forceps delivery. She had post-partum retention and had to be catheterized; in spite of precautions cystitis developed. Two weeks after delivery, dysuria and considerable difficulty in passing urine. Nurse noticed small yellow mass at meatus, next day this was larger, and on the third day a large yellowish white spongy membrane, streaked with blood was passed. There was considerable bladder irritation and hematuria for three weeks after passage of the membrane. This became gradually less, but the pain in the bladder and urethra persisted for several months. There was almost complete incontinence.

About three months after delivery a plastic operation on the perineum was performed, which was partially successful. She was seen September 6, 1907, by Dr. Garceau, to whom I am indebted for this note. "When awake and lying down bladder control is fair; when asleep there is dribbling; when on her feet

can retain urine one hour only. No pain, no irritation. Examination, lacerated perineum, retroversion, a dense band in the right side of vagina. Cystoscope shows urethra ¾ of an inch long, sphincter closes transversely, closure fair. Bladder capacity 90 cc. Urine clear. No vesico-vaginal fistula."

The writer first saw her on February 19, 1909, twenty-three months after the exfoliation. The history and condition were as follows: She can hold urine about an hour when up and about, but on laughing or coughing or any sudden unguarded movement, there is incontinence. She has to urinate five or six times at night. Sometimes there is incontinence all the time. Once for a week, following an electrical treatment she had almost perfect control, but after a second treatment condition returned as bad as ever. There is no pain or irritation. *Examination*—General condition good. Locally there is a cystocele, rectocele and retroversion, and a cicatricial band in right side of vagina. Urine spurts from catheter as soon as it has passed a little way beyond meatus. Urine clear, one or two flakes, pale, acid, 1012, no albumin. Bladder capacity 2 ounces. Cystoscopy was unsuccessful as fluid was rejected at once.

March 9, 1909—Patient thinks she has had a little better control. Bladder more tolerant, 2½ ounces injected but held with difficulty. Cystoscopy still unsatisfactory, but in the glimpse obtained bladder wall looked unusually white.

March 16—The day following the last examination the patient had been better than at any time since her confinement (except for the week mentioned) up to 9 o'clock in the evening, when she had an attack of intense pain on micturition which was accompanied with considerable difficulty. Frequency and pain continued all night, there was, however, no incontinence. Next day the discomfort was much less and the following day had disappeared entirely. She has never had a similar attack. Whether the cystoscopy, which was a short examination, was entirely or only partially the cause of the seizure, I am unable to say, but I think the cystocele had something to do with it, as difficult micturition is common in this condition.

Cystoscopy—Urine perfectly clear, few fine flakes. Bladder retains 2½ ounces. Bladder wall appears white, especially so at top, but it does not seem to be as strikingly so as last time. In places the wall shows trabeculation. In other places there is a suggestion of mild chronic cystitis, that is, the vessels are injected. The ureteric orifices are seen with difficulty, the capacity is so small that the manipulations of the insrument cause pain. The left orifice appears normal and the right widely dilated. The trigone is not well marked and paler than usual. Whether the slightly red appearance of the bladder is connected with the recent attack of pain and difficulty I cannot say at present, as this is the first time that the examination has been satisfactory in any degree.[a]

CASE 2. This patient was seen by my colleague Dr. A. L. Chute about three months after her confinement and I am indebted to him for permission to report the case and for the notes of the first cystoscopy. The history is as follows: Woman, thirty years old—previous general and urinary history negative. Two children, first pregnancy and labor normal. One and a half years later second labor (July 5, '08) duration, 10 A. M. to 3 P. M. difficult instrumental delivery. Late in the evening she had to be catheterized. She was catheterized the following morning and evening. On the second morning after delivery she thought she did not need to be catheterized as the urine had started to run. In the evening, however, she had to be catheterized because of the extreme pain from bladder distention and in spite of the overflow which had been going on all day, a large quantity of urine was obtained. From that time on the patient has had incontinence. The urine soon became

[a] Since this was sent to press I am able to add the following: Sept., '09. The patient has been having bladder irrigations about every five days of boric acid solution given to the point of tolerance of distention. The bladder capacity is now four ounces. During the day there is good control, the intervals between micturition having lengthened to over two hours; at the end of this time there is, however, an imperative desire, which, if not relieved, leads to incontinence. At night there is at times incontinence. On the whole the condition is very much improved. I attribute the improvement to the relief of a certain amount of chronic cystitis which was present. The urine is now clear, with a few flakes which are made up of squamous epithelial cells.

PLATE XXII.—Presented by Dr. R. F. O'Neill.

Fig. 2

Fig. 1.

Fig. 1. Membrane passed by urethra, composed of mucous and sub-mucous coats of the bladder with some elastic fibers. Mounted on glass cylinder. Actual size. (Dr. J. C. Warren's case. Table No. 30).

Fig. 2. Much thickened bladder with large diverticulum containing partially exfoliated mucous membrane. (Specimen No. 4968, Warren Museum, Harvard Medical School. Male Table Case No. 15).

foul in spite of twice a day bladder irrigations. Three weeks after delivery there was a sudden complete retention. The attending physician was immediately summoned and found something protruding from the urethra. Pulling upon this he delivered a large, dirty yellow, foul mass. Patient said this was larger than the hand and filled an ordinary jam jar, about 1½ inches from the bottom.

September 30th (about three months after confinement). She has suffered constantly from her bladder. Incontinence when on her feet; while lying down there is a certain amount of control, but she is obliged to micturate from four to six times a night. The patient is in good general condition. There is a moderate perineal tear, no vesico-vaginal fistula. Nothing remarkable about external meatus. Some excoriation of the neighboring parts. The bladder contained one ounce of foul, turbid urine. Urine, pale, foul, turbid, 1004, slightly acid, slight trace of albumin. Sediment considerable, pus free and in clumps, normal and abnormal blood, many round cells, but no squamous cells. Large number of bacteria. Stained specimens show many bacilli and cocci.

Cystoscopy—With a large catheter bladder could be made to hold three ounces of boric solution. Bladder wall everywhere fiery red with masses of shaggy muco-pus adherent, nowhere is there any suggestion of normal mucous membrane. The ureters seem to be tremendously dilated. There was marked tenderness and considerable bleeding.

January 20, '09, (about 6½ months after confinement) the condition has gradually improved since last examination. She has been having bladder irrigations with boric acid solution and silver nitrate solution 1-5000. To-day for the first time she held urine while on her feet for 1½ hours, while lying down control somewhat better. Micturition is still painful. The urine examination is the same as of last date, except that the odor is not particularly offensive and the sediment is less.

Cystoscopy—Capacity three ounces. The bladder is not nearly so red, so light absorbing or so sensitive as of last

note. In one place the wall is taking on a whitish look, no blood vessels seen. There appear to be two good sized cavities in place of the ureteric orifices. Five days later a ureter catheter passed into the left one of these cavities and several drachms of clear urine were obtained, (bladder urine was turbid) proving that they are the widely dilated and very abnormal looking orifices of the ureters.

February 24, '09 (7½ months after confinement)—Urine still turbid. Incontinence and bladder pain same.

Cystoscopy—Capacity same. Bladder much improved in appearance. Picture much clearer. The two cavities, which are the ureteric orifices, can be clearly seen. To the outside of the right ureteric opening is what appears to be a shallow diverticulum. Unsuccessful attempts to catheterize right side, bladder had become intolerant.

March 18, '09—Urine turbid with shreds. There is constant slight hematuria. If patient empties bladder she remains dry for ¾ of an hour, after this complete incontinence.

Cystoscopy—Same as of last note, except much clearer view, large cavernous ureters very distinct. Capacity, three ounces.

It is to be regretted that no histological examinations were made in either of these cases, as without them the reports are necessarily incomplete. However, the writer has no doubt, by the subsequent clinical course and the cystoscopic findings, that these were true cases of exfoliation with a very considerable involvement of the muscular coat, as shown by the capacity of the bladder and the loss of sphincteric control. The etiology and prognosis in these cases will be considered under these headings.

History and Nomenclature[b]—The passage of membranes from the bladder has been noted since very early times, as shown by an article by Willis[1] in 1650 and a case reported by Tulpius[2] in 1716. The earlier writers thought parts of the mucosa itself were expelled. This was later contradicted by Fontaine[3] and

[b] A full account of the early history of this subject can be found in the Thesis by Pepin.[21]

others, and opinion differed from time to time. Soon, however, cases were reported in which the histological examinations showed bladder tissue to be present in the extruded membrane. Luschka's[4] report on Bauer's[5] case in 1854 and the cases of Lever[6] and Lee[7] are the earliest accurate accounts. The reason for the then existing confusion was the number of different names under which the lesion was described. Even now the condition is very lightly dealt with by most textbooks[8] and is variously referred to as "Membranous," "Pseudo-membranous," "Croupous," "Diphtheritic," "Exfoliative," "Plastic" and "Gangrenous" cystitis, which terms are inadequate and misleading.

It is a well established fact that there are two distinct conditions: First, the false or pseudo-membranous type, which may correctly be called "croupous" or "diphtheritic," where the membrane is a fibro-purulent exudate; and second, the true form where portions of the various structure of the bladder wall have been cast off. This has been proved repeatedly by microscopical examinations. Guyon[8] has described these conditions very fully in a clinical lecture published in 1887. The second group is the one with which we are mainly concerned.

These cases should be described under the name of "Necrosis of the Bladder," suggested by Haultain.[9] The process may be of any severity and involve any or all coats of the bladder and occur with or without exfoliation. That the process is a true necrosis has been shown by experiments and pathological examinations to which I shall refer later on.

Pseudo-membranous Type—First a few words in regard to the pseudo-membranous type. It is impossible to differentiate clinically, without histological examination, between the two conditions, as is well shown by the following cases which are selected because a pathological report is given. They are as follows:

(1) Balvay[10]—Man, sixty-five, with a 24-hour retention, no previous history, except that he had been catheterized for a previous retention. Bladder distended to the umbilicus; no instrument could be passed per urethram; suprapubic puncture unsuc-

cessful; suprapubic drainage, several large pieces of membrane removed. Examination—Layers of fibrin containing pus-cells and red corpuscles. No bladder tissues present. Many colon bacilli. Pseudo-membrane.

(2) Harrison [11]—Delivery by version. Had been catheterized for a week, cystitis developed. On 18th day a membrane passed from urethra. Examination—Fibrin with red blood corpuscles, the whole in state of fatty degeneration. Thought to be an organized hemorrhage.

(3) Guyon [12]—Man, fifty-three. Sudden retention, previously difficult micturition for three months. Catheterized for five days. Urine became foul. Something over a month later complete retention. Catheterized—Urine ammoniacal and fœtid, constant drainage at night. At end of six days passed by urethra a large membrane. Examination showed no organized tissue present.

(4) Savor [13]—Woman, fifty-eight. Operation for tubo-ovarian cyst and carcinoma of tube. Had had some urinary symptoms previous to operation. Fourth day after operation acute cystitis. Eighth day began passing pieces of membrane which continued for a week. Examination—Many pus cells in a network of fibrin. No bladder tissues.

The formation of a pseudo-membrane is not infrequently due to the traumatism and infection during catheterization with the resulting cystitis and the contact of the bladder mucosa with purulent, ammoniacal urine (Balvay). It may also be associated with stone in the bladder, cases being reported by Dolbeau.[14] The symptoms do not differ materially from the true form, but the differentiation is important because of the prognosis, complete recovery taking place when the membrane is passed or removed, which may be quite the reverse in the true form. Death results if the membrane is retained.

Appearance and Composition of Exfoliated Membranes—We will now return to the consideration of the second or true type. These membranes are generally passed by the urethra in the female. When not so passed they are found, either at op-

eration or at autopsy, more or less separated from the remaining portion of the bladder wall; sometimes as a completely separated sac containing purulent urine. (Case of Jacobi, Male table No. 3.) This accounts for the great difficulty experienced at times in passing a catheter. The membrane may take the form of a cast of the entire bladder, sometimes showing the holes for the ureters, or it may come away in fragments of any size. The membrane in Dr. Warren's case, (see Plate XXII, Fig. 1) being the size of a lady's small handkerchief. In gross appearance the membranes are described as being of a dirty gray or yellowish white color and having a foul odor. They are of varying thickness, from $\frac{1}{8}$ to $\frac{1}{3}$ of an inch. One surface has a rough, gritty feel, from the secondary deposit of urinary salts, and the other surface is smooth and may be of a darker color; this surface having been in contact with the remainder of the bladder.

By referring to the table it will be seen that in a number of the cases the membrane is described as being composed of the mucous and sub-mucous coats, often with portions of the muscular coat and in a few cases portions of the peritoneum as well. (Haultain,[9] Case 1.)

Unfortunately no histological examinations were made in either of the two cases here reported. There are, however, careful examinations on record which I shall quote to show what occurs. The microscopic examination in the case of Margulies (Male table No. 14) was as follows: First—Necrotic, smooth muscle fibre, arranged as in normal bladder. Second—Connective tissue layer of varying thickness to which are attached in places, pieces of necrotic mucous membrane. The blood vessels in the section were dilated and choked with lime salts (Phos. of Cal., with Am. and Mag. Phos. probably of secondary origin). Necrosis of muscle shown by the poor staining and absence of nuclei. The entire thickness of the membrane was filled with bacteria of different kinds, separated and in colonies. Haultain[9] gives with great detail the findings in two cases, one showing the presence of all the coats of the bladder, including a piece of the peritoneum. The blood vessels were intensely engorged and

degenerated, and the various layers showed marked degenerative changes. In the second case the mucous and sub-mucous coats were so altered as to be unrecognizable. In the muscular coat the fibres were swollen and indistinct and minus their nuclei. The vessels were engorged and their contents granular. In other words, both these specimens showed changes due to a coagulation and hyaline necrosis secondary to extreme congestion of the blood vessels, the process in the last case not being so far advanced.

Instances could easily be multiplied, but these are sufficient to show that the underlying cause must be capable of producing a true necrosis which may involve the structure of the bladder to any depth. This brings us to the etiology of the condition.

Etiology—Taking as a starting point the proposition that this condition is a necrosis; what are the causes of necrosis? The newer pathologies [15] divide the causes into two groups.

First, direct causes, producing immediate cellular death, they are: (a) Chemical and bacterial toxins. (b) Mechanical injury. (c) Effects of heat and cold.

Second, indirect causes, by interference with the blood supply in various ways. (a) Injury or disease of the blood vessels. (b) Embolism. (c) Disturbances due to nerve influences. (d) Mechanical closure, by ligature, by pressure, or by over-stretching the tissues. Any of these causes may be aided by general conditions which weaken the tissue resistance, as age, diabetes, nephritis, acute disease (typhoid fever), debility, etc. The extent of the process is greatly increased by the secondary introduction of bacteria.

Now to apply these various causes to the clinical aspect. By consulting the table it will be seen that the predisposing conditions met with in the female are most commonly retro-position of the pregnant uterus, difficult or prolonged labors and incarcerated or twisted tumors of the uterus and pelvis. In almost all of these conditions there has been as well an associated retention of urine, sometimes to very great extent (Cocram, Table No. 27).

In the male cases retention was present in the majority of cases. In other words, in a majority of all cases pressure on the bladder wall from within or without, or both, was or had been present. Therefore, we must accept the fact that this pressure causes in some way an interference with the circulation and plays a large part in the etiology. There are, however, a few cases in the table where neither obstetrical pressure nor retention was present. Here we must take as our etiology the first or direct cause, that of destruction of tissue by bacterial toxins or assume that an inflammatory process of sufficient severity to occlude by pressure the numerous and delicate blood vessels with the resulting necrosis, occurs in the sub-mucous or vascular coat. More of these cases later.

To return to the effects of interference with the circulation, these have been very carefully put forth in a most excellent monograph by Haultain and I shall only very briefly review them here. In the first place the blood vessels of the bladder enter and leave the organ at its base and neck. Any pressure here will, therefore, affect the circulation of the organ.

It is of interest here to note a series of experiments that were performed on rabbits by Heubner [16] He ligated the bladder neck for a period of two hours, after which the circulation was allowed to be resumed. The animals were killed at various times from a few hours to five or six days later. Examination of the bladders of these animals showed the same conditions of necrosis to be present as have been already dscribed, thus proving that even a temporary interruption of the circulation may cause this condition. He then goes on to state that pressure on the bladder neck is clinically produced by retention of urine and by pressure of the fœtus during labor.

That retention of urine alone can cause necrosis of the bladder, was proved by a series of experiments by May,[17] who produced artificial retention in dogs.[c] In this connection the case of Dean (Male Table No. 9) is of interest, a two-day retention

[c] In these experiments retention was maintained until death occurred (60 hours) in two cases. In these cases the bladder wall was found to be the site

from impacted urethral calculus, also the cases of retention following surgical operations, Kelly, (Table No. 17) and Esau, (Male Table No. 10).

Haultain believes that retention causes circulatory obstruction by preventing the venous return. This is explained by the fact that the base and neck of the bladder, which contain the main vessels, offer the greatest resistance to distention by urine during retention, being the fixed part of the bladder. That the veins suffer (1) from the normal absence of blood pressure, (2) from their compressibility, and (3) from their more superficial position. The arterial supply is not so interfered with, hence the resulting tremendous congestion followed by necrosis.

When retention is associated with an incarcerated pregnant uterus,[d] the chances for necrosis are increased, as the venous return is already interfered with to a greater or less extent. Retroverted pregnant uterus alone, however, does not seem to exert sufficient pressure to produce necrosis, as in neither Haultain's collection of cases nor my own, has exfoliation occurred without an associated retention. It is, however, the cause of the retention and greatly aggravates the condition.

The most unique cause of retention was in case 1 of Gottberg (Table No. 21) where a vaginal tumor exsited which proved to be a bicornate uterus with atresia and retained menstruation on the left.

In Vahle's case, (Table No. 3) there was an incarcerated myoma of the uterus with an enormous retention.

When the obstruction of the circulation is due to labor, we have a complete shutting off of the blood supply, due to the pressure of the fœtus upon the baldder neck, with a resulting condi-

of extensive hemorrhages, particularly in the sub-mucous coat. The mucosa and sub-mucosa were separated at the fundus by an extravasation. The urine was filled with blood and epithelium. In three others the retention was continued intermittently for periods of twenty to thirty hours at a time for three weeks.

Examination of the bladder in these cases showed the mucosa and submucosa broken down and filled with granular material. The blood vessels were engorged. The urine was ammoniacal and filled with detritus.

[d] Pinard and Varnier[23] have written extensively on the association of this condition with retroverted pregnant uterus.

tion of anæmia. This probably occurs in either a small pelvis with a large child or some abnormal presentations. That this pressure need not be very long to produce changes in the vessels is shown by the experiments of Heubner.[16] With the re-establishment of the circulation comes congestion, then exudation followed by necrosis. Thus we see that in the two conditions, retention and obstetrical pressure, the mechanics of the obstruction are different, the results, however, are the same, both ending in necrosis.

The two cases here reported were undoubtedly due to the second condition, both having hard forceps deliveries. In case II there was a retention and over-distention of the bladder. In case I, I believe the retention to have been a post-operative one; it was never allowed to become extreme.

In the case of Lohlein (Table No. 26) the blood supply was obstructed by the torsion of a fibroid. There seems to be good reason, therefore, to assert that interference with the blood supply by retention or pressure is the primary cause in a number of these cases. That bacterial infection and the presence of a foul ammoniacal urine do much to help along I do not doubt in the least.

There are certain cases which cannot be explained by the foregoing. In Dr. Warren's case (Table No. 29) there was neither pregnancy nor retention. A dilatation of the vaginal outlet was performed upon a patient who had a moderate cystitis. Here was probably a slight trauma to the bladder, but sufficient to light up a severe inflammation.

In the case of Begouin (Table No. 15) there was a severe cystitis following immediately the injection of a strongly alkaline solution. I think there must have been here a bacterial infection as well, as I do not believe sodium chloride would have sufficient penetrating power to affect the muscularis.

In the case of Norris (Table No. 31) there is no history, except that of a severe colon bacillus cystitis. Here unfortunately there is no description of a membrane.

In several of the male cases (Jacobi, Male Table No. 3;

Fenwick, Male Table No. 7) the only history is that of cystitis. There are also cases associated with calculi (Stein, Dolbeau, Deschamps, Male Table Nos. 8-11-12).

It is not my intention to go at all into the bacteriology of the bladder, but I think the necrosis in all of these cases can be accounted for by the first or direct cause of cellular death, that is, bacterial toxins or the production of a severe inflammation, occluding the vessels of a part or the whole of the wall by pressure.

There are three cases occurring with a general systemic condition: The case of Orlowski (Table No. 16) following a severe dystentery. The case of Lemaire, (Haultain's Table No. 49) where there was a retention during typhoid fever. Death in the fourth week, retention had persisted for two weeks. There had been difficulty in passing the catheter. The case of Tronchet (Male Table No. 16) which was that of a diabetic with urethral stricture.

There are two cases associated with injury of the spine. Wilks, (Haultain's Table No. 55) and Southam's (Male Table No. 6) cases being examples of disturbed circulation due to nerve influences.

Cystoscopic Appearances—Although the two cases herein reported are lacking in respect to the pathological findings, I believe the record of the cystoscopic examinations will be of value, as there are but few observations reported upon this most interesting and important feature of the subject. Few as they are, however, they well illustrate the local conditions existing at different periods in the course of the lesion.

Taking the observations in the order of their clinical occurrence, the earliest in the disease is that of Norris (Table No. 31) who examined a patient three weeks before exfoliation took place. This was in a case apparently due to infection with the colon bacillus, there being no other etiological feature. He found the bladder contracted, thickened and reddened with numerous hemorrhagic areas. The trigone was more intensely injected. There was no actual ulceration.

Next in order comes the very striking observation of Mar-

gulies (Male Table No. 14) who cystoscoped a male patient under chloroform two days before operation. In this case the cystoscope was passed into the interior of the exfoliated sac, which had become almost, if not entirely, separated from the remaining wall. He gives the following description: The surface was everywhere of an equal dirty, gray-white color and entirely covered with what looked like a fine, short, hair-like crystalline deposit; this had a cilia-like motion with the currents of the bladder fluid. In places there were adherent accumulations of pus. The surface looked like "a piece of dirty, gray-white skin, covered with thickly set, dirty short hairs." Neither the trigone nor the ureteral orifices could be recognized. There was nowhere any normal bladder structure. The picture was entirely unusual and he was unable to interpret it at the time. Of course after operation the solution was clear. I think next in order come the various appearances described in detail in Case II, reported by the writer. They cover a period of several months, showing the gradual change in the bladder and the approach to the final picture which we shall come to presently. They need not be repeated.

Margulies describes the cystoscopic findings in his patient, seven weeks after operation, which are worth giving in full: Bladder holds 150 cc. The field is unusually pale, almost white, in places are a few pale looking vessels. The neck of the bladder, instead of being the usual dark red, is of a pale rose color. The trigone shows no changes on the right; the ureteric orifice being normal and situated on a small papilla. The middle and left portions of the trigone have an uneven appearance under the mucous membrane. The left ureter is dilated and crater-like, but not markedly so. The effluxes are equal and normal. The apex shows a small funnel shaped diverticulum at the site of the operation wound. The shape of the bladdder is very little changed. The most striking thing is the white appearance of the wall, especially on the left lateral and upper parts. This is of interest because during the early part of his illness the patient had pain and marked tenderness in the left lower abdomen.

In this case a large part of the muscular coat was exfoliated and Margulies concludes that a regeneration of the necrotic parts must have occurred to a considerable extent, that the process was more extensive on the left, and the trigone and structures at the neck very slightly damaged, which accounts for the excellence of the control,—urination taking place at normal intervals. I feel that the time, seven weeks, is too short to consider this an end result.

Stoeckel [18] describes the findings in two cases of exfoliation, which are most striking. In the first case (Table No. 19) the result is poor, there being incontinence and a small vesico-vaginal fistula as well. In the second case (Table No. 20) recovery occurred and the condition is given at the end of one year and nine months. The pictures are very similar, but in Case II the sphincter was not seriously involved. He considers the appearances typical of the end result.

Case 1 (Table No. 19). A very abnormal view, nothing is to be seen of the trigone or normal ureteral openings. Immediately behind the sphincter two deep funnel shaped openings like diverticula, lay on the right and left side and equally distant from the internal orifice of the urethra. They were flat toward the median line and grew deeper towards the outside. These were the much dilated ureter mouths. There were no contractions; they remained wide open and unchanged, but urine was seen to trickle from each. The rest of the bladder wall was brilliantly white with a few irregularly placed tortuous vessels. The sphincter was represented by a thin pale red band. Below the ureters was a small opening about the size of a normal ureter. This proved to be a vesico-vaginal fistula.

Case 2. (Table No. 20.) (There is a colored illustration accompanying the description). In this case the bladder wall had the same white appearance and the ureteric openings were two large, smooth-walled cavities. The bizarre and irregular configuration of the bladder was striking, deep and shallow diverticula alternated with projecting bands which divided the bladder into larger or smaller portions, like septa. These trabeculæ were

distinguishable by their reddish coor. The ureters were catheterized in this case; some difficulty was experienced at the beginning of the ureter in passing the catheter. The base of the bladder was displaced to the left, the right ureteric orifice being in the median line and the left far around to that side. These descriptions correspond entirely with the appearances in Case II of this article—the dilated ureters, the beginning diverticula and the beginning whiteness of the wall, the process only being in an earlier stage.

The appearances in the writer's case (1) are given in detail in the case report. While the picture was not normal by any means, no such striking changes are present as in the other cases.

These are all the observations that the writer has been able to collect.* There is a short description of the conditions given in Knorr's[19] book on "Cystoscopy in Women." He quotes from Stoeckel.

Symptomatology and Diagnosis—The most constant clinical feature of the lesion is the condition of the urine. This is ammoniacal and fœtid, contains albumin, pus and blood and quantities of detritus. In some cases bits of membrane are passed, containing bladder tissue from which the diagnosis can be made. The urinary symptoms include retention, dribbling from an over-flow bladder and also those of an acute cystitis. There is one phenomenon which has been described in a number of cases and when met with should excite suspicion, that is, the inability to empty a full bladder by catheterization. When only a small quantity of urine or pus is obtained the catheter has been occluded by the exfoliated sac. Sometimes there are grave constitutional symptoms with elevation of pulse and temperature. In some a severe course is run without any temperature at all (Margulies' case.) In some instances the diagnosis may be made

* Since this article was written Dr. F. R. Hagner, of Washington, has reported a case of necrosis of the bladder (Male Table, Case 18), in which he was able to make a cystoscopic examination. He says: "Bladder capacity enormous, entire mucosa absolutely black, had the appearance of gangrenous tissue. Impossible to obtain a satisfactory view of the outline of the prostate, as it was covered with masses of gangrenous tissue."

by finding the cystoscopic appearances described by Margulies, but the symptoms as a whole are vague and unclassified. When the membrane presents at the urethra the diagnosis is clear and is easily made from that of inversion of the bladder.

Course—Necrosis of the bladder may be divided anatomically into four groups, according to the various layers involved. First, the mucosa; second, the mucosa and sub-mucosa; third, when the muscular coat is involved as well; and fourth, when the peritoneum is included. The second class is the most common.[t]

In one of the cases, that of Robinson (Table No. 32) the membrane was described as being composed of "several imbricated layers of epithelial cells, arranged as in those of a normal bladder. The cells are in part necrotic and show no leucocyte infiltration." The symptoms were slight and the recovery quick. In this case the process was certainly a very superficial one and might well be described as an "exfoliative cystitis."

When the process is limited in extent or confined to the coats, exclusive of the peritoneum, the necrosed tissue is thrown off in the process of repair, as in other parts of the body. When there has been retention with stretching of the bladder, separation is said to begin at the fundus, that is, opposite to the place of greatest resistance to dilatation. It is here that the effects of the unequal elasticity of the coats are first manifested, the peritoneal and the external muscular coats being much more distensible than are the internal muscular and the mucosa. Separation having begun and being increased by the outpouring of serum, local necrosis takes place, which is soon followed by perforation of the membrane by the decomposing urine which aids in the dissecting process. This is carried on downward to the neck of the bladder (Boldt).[20] That the neck is the last place to become separated is borne out clinically, as at some operations and autopsies the membrane is found free, except at this point. The membrane is finally expelled by the pressure of the retained urine behind it. When portions of the peritoneum are exfoli-

[t] The sub-mucosa is most commonly affected because of the number and delicacy of its blood vessels.

ated, the neighboring organs take place in the process of repair, a secondary sac being formed by inflammatory adhesions, which later become changed into fibrous tissue (Haultain.)[9]

Complications—General sepsis and uræmia are occasionally the cause of death. Perforation and rupture of the bladder occur, but apparently they are not common; when they do occur, however, peritonitis of a virulent nature results. We have seen, however, that portions of the peritoneum may be cast off when protected by pericystic adhesions. These pericystic adhesions occur in severe cases causing distortions of the bladder, as is illustrated in Stoeckel's case II. The kidneys do not seem to suffer much in this condition, except in the cases of general sepsis, that is, they are rarely mentioned in the descriptions. The case of Begouin being an exception here, a nephritis was said to have resulted.

Prognosis—By consulting the table of thirty-four cases occurring in females collected by the writer, it will be seen that there were eleven deaths. In three was no exfoliation (Table Nos. 1-2-3); in one there was rupture of the bladder (Table No. 4). In six cases the membrane was exfoliated, but remained in the bladder, one of these deaths being due to uræmia; and in only one case (Case of Williams, Table No. 7) did death occur when the membrane had been passed. This was apparently a badly septic case, although the notes are very meagre. This gives seven fatal cases out of thirty of exfoliation. These figures are a little better than those given by Haultain, who collected fifty-three cases in the female with twenty-five deaths. Of these twenty-five, in fourteen there was no exfoliation, eleven of which were due to rupture of the bladder and three to sepsis or uræmia, leaving eleven fatal cases out of thirty-nine cases of exfoliation, the total of the two tables gives eighteen fatal cases out of sixty-nine, which does not seem a high death-rate, considering the gravity of the lesion and the fact that in some of the cases which recovered, portions of the peritoneum was exfoliated. (Haultain's Case 1 which is No. 40 of his table, also cases 18-26-34, same table). Some of the

cases associated with retro-position of the uterus with urinary retention extending over a number of days seem to be very fatal.(g)

In regard to the writer's table of eighteen cases occurring in males, there were eight deaths. In five of these (Bosc, Jacobi, Clarke, Southam and Museum Specimen) detached membranes were found in the bladder at autopsy, one being associated with a diverticulum (Museum Specimen) and one case had a fracture of the spine (Southam). The sixth case (Stein) had passed pieces of membrane, but died probably from renal insufficiency or sepsis, having had renal calculus and pyonephrosis. The seventh case (Tronchet) was a diabetic, and in the eighth (Pepin) operation was so long delayed as to be useless. In the remaining ten cases the membrane was either passed or successfully removed by operation. Haultain gives three fatal cases in men.

The prognosis in general should be guarded, but may be said to be excellent as regards life in both sexes, if the membrane is not retained. Retention of the membrane is followed by death.

As to the functional restoration of the bladder or the end results, these vary all the way from complete recovery to complete incontinence. When the damage has been severe, however, the bladder capacity and control are more or less injured. In the writer's opinion the disability is in proportion to the extent of the destruction of the muscularis, and particularly to the middle layer which is continuous with the sphincter. When the vesical neck and trigone are injured to the extent observed in Stoeckel's Case 1 and the writer's Case 2, it is not surprising to find incontinence, there being not only distortion and contraction of the bladder, but almost complete destruction of the sphincter as well. If, on the other hand, the trigone and vesical neck are only slightly involved, even though a large part of the muscular coat be lost, as in the case of Margulies, functional recovery may take place. He believes that a true regeneration occurred in his patient; the time, seven weeks, seems short to the writer. Be

(g) According to Dührssen[22] when the retention has persisted 14 days, necrosis always takes place no matter what the treatment. (See cases, Gervis and Vahle, Table Nos. 1 and 3.)

that as it may, we know that large parts of the bladder have been resected surgically both by accident and intention, and that good functional recovery has occurred when the more complicated structures of the base have not been disturbed. When the mucous and sub-mucous coats only are affected good recovery will probably take place.

It may be of interest to add here that Dr. Warren's patient is living in this city and is perfectly well, more than fourteen years after the exfoliation. Here, however, the membrane contained elastic fibers, but no muscle. Unfortunately there are only very few accurate descriptions of the final results. In the writer's cases, Case 1, now over two years having elapsed since the exfoliation, may be taken as an end result. Before treatment the condition was a distressing one, there being incontinence on any unguarded action, as laughing or coughing. After several moths of forcible bladder irrigations the control is however much improved, micturition taking place about every two hours during the day. At times at night there is incontinence. There is no pain or inflammatory condition, but the capacity is small. At present it seems as if the end result in Case 2 would be the same, if not worse, there being very little power in the sphincter.

Treatment—This must be symptomatic at first, consisting of the ordinary internal and local measures used in cystitis. Should retention or difficult micturition be present, constant drainage should be established. If constant drainage fails, drainage by cystotomy is indicated. Of course if the membrane presents at the meatus it is to be removed, followed by frequent intra-vesical irrigations.

In the cases occurring in men the only hope of recovery is in operation. Although the diagnosis has rarely been suspected the symptoms are fortunately so severe as to demand an exploratory operation. The suprapubic route is preferable. It is a notewothy fact that all the male cases operated on have recovered, with the exception of (Case 15, Male Table), where the membrane was in a diverticulum (see Plate X, Fig. 2) and (Case 17, Male Table), where operation was too long delayed.

It seems to the writer that opening the bladder above with complete removal of the membrane and more adequate drainage than is afforded by the urethra would yield better results in some of the very septic cases occurring in women, particularly when there is an intermittent retention from fragments. No such cases are, however, reported, the nearest being that of Arroyo, (Table No. 28) where a vesico-vaginal fistula was dilated for better drainage.

Male Cases—These cases have been referred to in part in the paragraphs on etiology and prognosis, but there are certain points which will be of interest to take up a little in detail. The most striking fact in the series is the excellence of the result obtained from the operative removal of the membrane. These good results have naturally been mostly among the more recently reported cases, where operation has been undertaken early for obtaining satisfactory bladder drainage. For this reason cases will be reported with increasing frequency in men, although there is little doubt that the disease is much more common in women, because of the complications which may occur during pregnancy and labor.

Spontaneous cure, by passage of the membrane, occurs in a large proportion of the female cases because of the shortness and dilatability of the urethra. This has been reported but once in the male, the case of Buchanon (Male Table No. 2) where a complete cast of the baldder was passed per urethram, said to have resembled the mucous membrane. There was no examination, but the case is unique in that so large a membrane should be passed per urethram. In Stein's case (Male Table No. 8) fragments of membrane were so passed. The pasage of the membrane entire as well as in pieces has been noted when there has been a perineal wound. (Male Table Nos. 4-7-11-12-13). It will be seen by the table that retention, severe cystitis or calculi were present as factors in the etiology in all of the cases but one. That is the case of Margulies, where the etiology is very obscure. This case I have cited so frequently that I think it will be of interest to give a more detailed abstract than is to be found in

the table. The original article contains the most complete case report that has been published. It is briefly as follows:

A man, thirty-four, single, entered hospital July 30, 1903, with difficult micturition, pain and hematuria—gave the following history: Previous to his twenty-eighth year had had several attacks of urethritis at intervals of one to one and one-half years; for the last seven years good health. In March, 1903, after exposure had a moderate urethral discharge which yielded to treatment in six weeks. Urine was then clear. In May, 1903, severe pain in ankles and back, diagnosed as a gonorrhœal condition. He was in bed for a month and a half, and later went to a seaport sanitarium where he took a course of treatment of baths, etc. For the last three months there had been no sexual exposure, he was feeling well and was about to return. The only trouble remaining being an obstinate constipation lasting from six to seven days. He went to bed feeling perfectly well; at 3 A. M. got up with tremendous desire to micturate but was unable to do so. After repeated efforts, there was priapism followed by urine and blood. In spite of passing urine the desire continued, followed by almost clear blood every ten to fifteen minutes. Treatment—Ice, ergot and bladder irrigations. This condition persisted twenty-four hours, nearly exhausting the patient. Urine was turbid, showed blood, albumin, no kidney elements, no odor, no bacteria; it was neutral, 1018 sp. gr., a moderate number of leucocytes in the sediment.

The local condition gradually improved and at the end of six days the patient decided to leave for the city. There has been severe pain all this time in the left side of the abdomen.

Examination—Abdomen somewhat large and tender, especially on the left. Palpation showed an enormous fecal accumulation in colon. Bladder region sensitive and somewhat distended. No. 18 sound, urethra uneven, prostatic urethra tender. No stone felt. Prostate small, firm and slightly tender. Urine, dark, bloody, turbid, no odor, sp. gr. 1024, albumin present. Sediment contained pus, blood, crystals, no kidney elements, no gonococci or other bacteria. For three days no improvement.

Bowels were cleared. Put on constant drainage for a few days with bladder irrigations. In a few days condition improved, urine cleared and contained less blood, abdominal pain almost gone.

On eighth day after admission awakened suddenly by an attack similar to the one described. Attempts at micturition brought only a few drops of turbid urine and blood. This persisted for twenty-four hours. Yielded to ice and morphia. After a few days constant drainage again put in, urine again contained pus. A week later again improvement under the same treatment. Suddenly a third attack similar to the others lasting twenty-four hours. This time the pain subsided, but the urine contained an increased amount of pus and cystals. From this time on, the condition became worse, the urine became more foul. Micturition difficult, constant drainage was not tolerated. The bladder could not be emptied with a catheter, only a few drops of pus obtained and irrigation fluid would not return. Operation advised but refused. Patient agreed to be put under chloroform in the hopes that a cystoscopic examination could be made. This was done the next day, September 2 (The findings have already been given under "Cystoscopic appearances"). The day following this there was severe suffering from painful and difficult micturition and the patient asked for an operation. On September 4th suprapubic cystotomy was performed. A gray looking mass presented which was easily removed as it seemed to be unattached. This gave the appearance of the removal of the entire bladder. There was almost no bleeding. The remaining wall was red and granular looking. The convalescence was uneventful. The structure of the membrane and the other features in this case have already been given.

That this extraordinary case was one of true necrosis is shown without doubt, but the primary cause is obscure. It is probably due to some bacterial infection, as there seems to be no other reason to suspect an interference with the circulation, unless we consider the possibility of the large fecal impaction in some way taking part. This seems to be highly improbable, however, as the accumulation was stated to be in the colon and not in rectum.

Even in the latter situation I doubt if such an accumulation could exert sufficient pressure to interfere with the circulation.

Table—In making the table I have taken from the case reports what seemed to me to be the interesting and essential features. The reports varied greatly in their completeness and must be taken at their face value. I have purposely refrained from abstracting any of the cases collected by Haultain. The reference portion of this table is added for the sake of completeness. the results given as recoveries do not in any sense refer to the local conditions. Those wishing the details are referred to his, or the original articles.

Conclusions.

From this brief presentation of the subject I think the following conclusions may be drawn:

(1) Necrosis of the bladder occurs as a result, primarily of interference with the circulation of the organ, aided by bacterial infection.

(2) The interference with the circulation may be produced by mechanical pressure outside the bladder, or by bacterial inflammation within the bladder wall.

(3) The condition is more common in women than men.

(4) The clinical symptoms are vague. Retention (when associated with cystitis) which cannot be relieved with catheter should excite suspicion. This is particularly true in women.

(5) There is a typical cystoscopic appearance by which the diagnosis can be made if the examination is made at a certain time.

(6) The prognosis as to life on the whole, is good in women. In severe cases permanent injury to the urinary function will result.

(7) The prognosis in men is good if the membrane is removed.

(8) Operative treatment is always indicated in men, occasionally so in women.

(9) The lesion is a rare one.

(10) The careful study of any further cases is to be desired.

In conclusion I wish to thank Dr. W. F. Whitney, Curator of the Warren Museum, for permission to use the Museum's specimens from which the accompanying photographs were made.

REFERENCES.

1 Willis: Dissertatio de Urinis, 1650.
2 Tulpius: Observ. Med. Lugduni Batavorum, 1716 (Haultain's Table).
3 Fontaine: Catarrhe de la Vessie, Thesis, Paris, 1815.
4 Luschka: Vichow's Arch., 1854, p. 30.
5 Bauer: Med. Corresp. Bl. d. Wurtemb. arztl. Ver. Stuttgart, 1853 vol XXIII.
6 Lever: No. 51 p. 408, Guy's Hospital Reports 1852, (Haultain's Table).
7 Lee: Path. Trans. London, Vol. XV p. 136, (Haultain's Table).
8 Guyon: Annal. des. Mal. des. Org. Génito Urinaires, July & Aug., 1887.
9 Haultain: Reports of the Lab. of the Royal Col. of Physicians, Edinburgh, 1890, Vol. II, p. 185.
10 Balvay: Lyon Méd. LXXXVII, 1898, p. 287.
11 Harrison: Jour. Am. Obstet. Suppl. Jan. 1882.
12 Guyon: Jour. Am. Obstet. Suppl., Aug, p. 464.
13 Savor: Wiener Klin. Woch. No. 44, 1895.
14 Dolbeau: Tr. Prac. de la pierre dans la vessie, 1864 p. 309.
15 Keen's System of Surgery. Vol. I, p. 313.
16 Heubner: Die Experimentelle Diphtherie, Leipsic, 1883.
17 May: Inaugural Dissertation, Giessen, 1869.
18 Stoeckel: Monatsber. f. Urol. Berlin, 1902, VII, p. 206.
Monatsch. f. Geb. u. Gynäk., Berlin, 1903, p. 1239.
19 Knorr: Cystoskopie und Urethroskopie beim Weibe.
20 Boldt: American Journal of Obstetrics, 1888 Vol. 21, p. 350.
21 Pepin: Thesis, Paris 1893.
22 Pinard & Varnier: Annal. de Gynécol. et d'Obstét., Feb., 1887.
23 Dührssen: Arch. fur Gyne., 1898, Vol. 57, p. 113.

TABLES PRESENTED BY DR. R. F. O'NEIL

TABLE OF REPORTED CASES OF NECROSIS OF THE BLADDER

COLLECTED BY R. F. O'NEIL, M. D.

CASES OF NECROSIS OF THE BLADDER OCCURRING IN FEMALES

Cases of Necrosis Without Exfoliation.

No.	Name.	Cause	Structure of Exfoliated Membranes	Result	Reference.	Remarks.
1	Rasch	Retro-flexed gravid uterus with retention.	No exfoliation. Bladder wall black and sloughing in places. Autopsy.	Death.	Trans. Obstet. Soc., London, 1889, XXXI, p. 129.	Patient felt something give in abdomen while scrubbing floor. 36 hour retention followed by dribbling. Catheter drew off pint bloody urine. Patient collapsed, died few hours later.
2	Gervis	Retro-displacement, 5 months' pregnancy. Retention.	Passed no membrane. No autopsy.	Death.	Obstetrical Transactions, 1874, No. 16, p. 233.	33 years old. Two weeks previously retention, since dribbling. Poor condition. Bladder above umbilicus. Catheter, six pints porter colored urine. Uterus replaced. Death next day.
3	Vahle	Incarcerated myoma of uterus. Retention.	Autopsy. Hemorrhage in bladder wall with necrosis of muscular coat. Intestines adherent to bladder. Local peritonitis.	Death.	Inaug. Dissertation, Marburg, 1893.	Age 48. Urinary symptoms 14 days. Catheterized 8 days before entrance. Condition poor. 2900 c. c., turbid urine drawn on entrance to hospital. Diagnosis of impacted fibroid was made. Death in 4 days.

Necrosis with Perforation or Rupture of Bladder.

No.	Name.	Cause	Structure of Exfoliated Membranes	Result	Reference.	Remarks.
4	Oliver	Retro position, 5 months' pregnancy with retention.	No membrane passed. Autopsy. Bladder ruptured fundus. Sloughing area 1½ in. square.	Death. Peritonitis.	Lancet, 1890, Vol. I, p. 638.	Retention with overflow bladder.

Cases of Necrosis With Exfoliation.

5	Gervis	Retro-displacement, 4 months' pregnancy. Retention.	Not given. Small pieces interfered greatly with catheterization.	Death.	Obstetrical Transactions, 1874, No. 16, p. 233.	36 years old. 12 days previously noticed urinary trouble, passed very little urine for last 3 or 4 days. Much distended bladder, urine foul and dark. Uterus replaced. Miscarriage and death next day.
6	Favell	Labor.	"Complete cast of bladder. Mucous membrane."		Lancet, 1900, Vol. II, p. 1352.	He showed a specimen before the Sheffield Med. Chirurg. Soc., passed per urethram 6 weeks after labor, no details.
7	Williams	4-5 months pregnancy. Retention.	"Mucous membrane of bladder passed in a gangrenous condition."	Death. Sepsis.	Obstetrical Transactions, 1874, No. 16, p. 258.	3 days retention. Bladder enormously distended. "In two days membrane was passed."
8	Plaut	Extra-uterine pregnancy.	Autopsy. Bladder contained turbid urine and a completely necrotic membrance said to be mucosa.	Death. Peritonitis. General Sepsis.	Inaug. Dissertation, Berlin, 1899.	Remains of bladder wall showed a diphtheritic membrane and an opening into the uterus. Cervix and vagina also showed a diphtheritic membrane. There was a localized collection of pus on the left. The anterior surface of rectum and posterior surface of uterus covered with black pseudomembrane with an opening into vault of vagina. There had been an operation, probably for drainage.
9	Kiwisch	5 months pregnancy.	Incomplete sac passed composed of mucosa.	Recovery.	Vierteljahrschrift für Heil kunde, Prag., 1844, Zweit. Quat. p. 37.	Painful micturition. Urine dark and foul. Patient aborted 10 days after passing membrane.
10	Otis	Delayed 2d stage post-partum, retention.	Mucous and submucous coats.	Recovery slow, but finally complete. Capacity somewhat reduced.	Boston Med. and Surg. Journ., May 17, 1883, No. 20, p. 458.	Catheterized for a week. Symptoms of acute cystitis. Sudden retention on 33rd day after delivery. Membrane found protruding from urethra removed with some difficulty. Incontinence for some time.

No.	Name	Cause	Structure of Exfoliated Membranes	Result	Reference.	Remarks.
11	Corkhill	Retro-verted uterus. 5 months with retention.	Structure not given. "Grey sloughing mass."	Recovery. "Holds urine well, which is clear."	Lancet, 1887, Vol. II, p. 1311.	Catheterized under ether 6 pts. foul urine. Miscarried. Membrane appeared at meatus 28 days after retention, was removed in pieces in several days.
12	Hass	Uncertain.	Mucous and sub-mucous coats, elastic, but no muscular fibers seen.	Recovery with frequency.	München. Med. Woch., 1889, XXXVI, p. 401.	Patient had an abortion at 3 mos. Position of uterus normal. Had bladder irritation for short time before. Became much worse in spite of local treatment, and 10 days after abortion membrane appeared at meatus.
13	Lockhart	Cystitis following a long and difficult labor. (?)	Membrane passed in two pieces. Muscular coat was present.	Complete recovery in two months.	Montreal Med. Journal, July, 1891, Vol. XX, p. 1.	Bladder trouble dates from a difficult labor 2 years ago, 4 days of uterine inertia, this was followed by incontinence, which recovered so that patient could hold urine 3 hours during day, but not at all at night. Condition became so bad, frequency and pain, that she entered hospital, no improvement under treatment. Unsuccessful attempt to repair perineum. About 3 mos. after entrance passed two pieces membrane, after which was gradual recovery.
14	Southam	Retroversion(?)(Patient wore a pessary because of bearing down pains). Probably infection.	Mucous, sub-mucous and in places parts of the muscular coat.	Complete recovery in six weeks.	Med. Chron. Manchester, 1892, Vol. XVII, p. 230.	No mention of pregnancy, symptoms of cystitis five weeks, on entrance to hospital incontinence, foul urine. Treatment, irrigations, no improvement, patient passed membrane 4 weeks after entrance.

15	Begouin	Intra-vesical injection of Sat. Sol. of Sod. Chlor.	Sub-mucous and muscular coats.	Almost complete incontinence. Nephritis.	Arch. Cliniques de Bordeaux, 1892, Vol. I, p. 479.	By mistake the patient injected sat. salt sol. into the bladder to produce an abortion at 5 mos., immediately great pain and tenesmus which continued more or less till membranous cast was passed 30 days later. Pregnancy went on to seven months.
16	Orlowski	Followed a severe attack of dysentery.	Gangrenous bladder mucosa.	Recovery.	Cent. f. Chir., Leipz., 1888, XV, p. 855.	Girl 3 years old, attack of dysentery, improved in 8 days. Suddenly bloody foul urine, cleared up quickly, but returned in few days with retention. A small amount of foul urine with catheter, then after violent contraction of bladder a grey white slough appeared in catheter. On removal this was followed by a gush of purulent urine. Treatment, Boric acid irrigation.
17	Kelly	Over-distended bladder following ovariotomy.	Portions of mucosa were cast off.	Patient became insane and died one year later.	Kelly's Operative Gynecology, Vol. I, p. 381.	Patient ran a high temperature, became insane, died in a year in an asylum from pulmonary tuberculosis.
18	Ribnikar (Case II)	Retention after labor.	Autopsy. Bladder gangrenous, extending into abdominal wall. Bladder mucosa separated.	Death. General sepsis in 6 weeks.	Inaugural Dissertation, Zurich, 1882.	Woman 36, Para II, cystitis during pregnancy. Unsuccessful attempt to catheterize followed by incontinence.
19	Stoeckel (Case I)	Retro-flexed pregnant uterus.	Membrane passed in shreds. Probably muscular coat destroyed.	Incontinence.	Monatsber. Urol., Berlin, 1902, VII, p. 206.	Patient was tamponed for bleeding during pregnancy. There was some injury to bladder as a vesico-vaginal fistula resulted. This was unsuccessfully operated on, incontinence continued.

No.	Name	Cause	Exfoliated Membranes Structure of	Result	Reference.	Remarks.
20	Stoeckel (Case II)	Protracted labor. Forceps delivery at end of several days.	Complete cast of bladder. Muscular coat not injured.	Frequency for a time. Complete recovery at end of 1 year and 9 mos.	Monatsber. Urol., Berlin, 1902, VII, p. 206.	5 days after delivery incontinence for 4 weeks. 5 weeks after delivery severe abdominal pain and grey sloughing membrane found protruding from urethra which was removed.
21	Gottberg (Case I) (Werth)	Vaginal tumor, which proved to be bi-cornate uterus, with atresia and retained menstruation on left. Retention of urine.	Large piece of membrane much disorganized, but containing elastic fibers.	3 months later frequency every 15 to 30 minutes.	Inaugural Dissertation, Kiel, 1892.	Girl 18, for 6 months urinary difficulties in connection with menstruation. Ten days before admission to hospital, complete retention, next day 2½ litres with catheter. Operated upon for hematometra, 200-300 c. c. chocolate colored fluid removed. After operation bladder washed daily as urine was ammoniacal. 28 days after retention passed membrane.
22	Gottberg (Case II) (Werth)	Myoma of uterus-trauma, urinary retention.	Complete closed sac. Structure not given. Grey in color. Urinary salts on inside.	Day control, night incontinence.	Inaugural Dissertation, Kiel, 1892.	Woman 42, symptoms of myoma. Thrown from sleigh, struck abdomen after which pain and retention, catheter could not be passed. 8 days later hematuria, followed by incontinence 7 weeks, urine foul. Membrane was passed, followed by 2nd retention and incontinence 14 weeks. Operation for fibroid successful.
23	Veit (Case I)	Retro-flexed pregnant uterus with retention.	Not given. At autopsy large pieces of membrane found to have been cast off.	Death from uræmia in two days.	Samml. Klin. Vorts., Leipz., 1879, No. 170.	Patient in asylum. Incontinence came on after attempt at suicide. Bladder enormously distended. The uterus had been replaced.
24	Veit (Case II)	Retro-flexed pregnant uterus, 5 mos. retention.	Structure not given. Passed in fragments.	Frequency for some time. Final recovery.	Samml. Klin. Vorts., Leipz., 1879, No. 170.	40. Frequent micturition, later incontinence, general condition poor. Bladder distended to umbilicus. Urine foul, 4 days after uterus had been replaced, abortion. Later fragments of membrane passed. Incontinence 4 weeks.

25	Hartmann	Retroverted, gravid uterus, 4 months. (Adherent.) Retention.	Autopsy. Membrane in bladder. Mucous membrane and part of muscular coat much altered.	Death. Septicæmia.	Bull. Soc. Anat. de Paris, LXIII, p. 516, 1888.	Patient 21, 2d pregnancy. Difficult micturition, sudden retention. Catheterized without precautions, large quantity urine. Catheterized next day, after which dribbling. 7 days later entered hospital. Large quantity foul urine drawn, urinary difficulty and retention continued. There was an obstruction to catheterization, bladder could not be emptied. Death from sepsis. Attempt to replace uterus unsuccessful, found adherent at autopsy.
26	Löhlein	Torsion from a subserous myoma in fundus of uterus, causing change in circulation.	Autopsy. A completely separated cast of bladder found with a dissecting hemorrhage.	Death.	Zeitschr. f. Geburtsh. u. Gynäk., 1888, XIV, 584.	Specimen from woman 36. 3 days after operation for fibroid some incontinence. 5th and 6th days hematuria. Urine foul, ammoniacal. Urine normal before operation. Partial separation was suspected, because of difficulty in introducing irrigating catheter. Patient failed and died.
27	Cocram	Tremendously overdistended bladder in a retroflexed, gravid uterus, 4 months.	Entire mucous membrane of bladder, showing ureter orifices. Removed in two sections.	Complete recovery.	Med. News, 1893, Vol. 63, p. 633.	Bladder distended to one inch of ensiform. Incontinence on exertion. Bladder emptied with catheter, urine bloody. In a week normal urination. Ten days later T. 103. Abdominal tenderness. Tenesmus with bloody urine. Urethra was found blocked by sloughing tissue.

No.	Name	Cause	Structure of Exfoliated Membranes	Death.	Reference.	Remarks.
28	Arroyo Samaneigo	Difficult labor with retention.	Structure not given, large sloughing membrane and smaller pieces. Muscular coat probably badly damaged.	Recovery with incontinence. Capacity of bladder 30 c. c. urethro-vaginal fistula.	Rev. Valenc. de Cien. Med., Valencia, 1904, Vol. VI, No. 81, p. 203.	25 years old primipara. Seen 18 days after confinement, had incontinence on motion from overflow bladder. Catheter 800 c. c., foul urine. Became worse, taken to hospital 10 days later. Vesico-vaginal fistula had developed which was dilated for drainage. Patient had passed pieces of tissue through fistula which at times became blocked by membrane. One week after entrance, large piece removed. Patient was very ill with uræmic symptoms. Vesico-vaginal fistula healed. There was a resulting cicatricial deformnity of vagina which had been intensely inflamed and ulcerated.
29	Warren	Dilatation of vagina for vaginismus.	Mucous and submucous coats with some elastic fibers. Complete cast.	Complete recovery in about 2 years. 16 years later perfectly normal.	Boston Med. and Surg. Journ., June 25, 1896.	Patient had had bladder symptoms for 6 mos, previous to operation. After leaving the hospital in 2 weeks, cystitis, much worse. 2 weeks later urine foul, alk. alb. blood, pus. 5 days later symptoms of obstruction, foreign body protruding from meatus. There was modern retro-flexion.
30	Praeger	Incarcerated uterus about 3 months.	"Necrotic portion of bladder membrane."	Bladder capacity reduced. Incontinence at last note. 6 mos. after.	Munch. Med. Woch., 1906, LIII, p. 1275.	Patient miscarried, was curetted, bladder symptoms followed, passed calculi, had foul urine and incontinence. Digital exploration of bladder, many flat stones removed and a loose floating mass felt which on removal proved to be necrotic bladder membrane.

31	Norris	Colon bacillus Cystitis.	"Cast of bladder."	Recovery.	Am. Medicine, 1906, Vol. XI, p. 478.	32, no pregnancy, no retention. Symptoms of cystitis 8 weeks. Cystoscopy showed acute cystitis. Urine alk., cloudy. Colon bacillus pure culture. Improved in two weeks. Allowed to go home, to return for treatment, failed to do so. Returned in a week with a 14 hour retention and a sloughing mass protruding 4 inches out of meatus, being removed proved to be a cast of the bladder.
32	Robinson	Cystitis(?)	A flat piece of tissue consisting of epithelial elements only.	Complete recovery.	Albany Med. Annals, 1907, XXVIII, p. 175.	Woman 40, no pregnancy. Two previous attacks of cystitis. Recovery rapid under local treatment.
33	O'Neil (Case I)	Long, hard forceps delivery. Post-partum retention.	"A large grey white spongy membrane."	2 years later, bladder capacity, 2-3 oz. Incontinence on exertion. Improved under treatment. Capacity now 4 oz.		Patient had to be catheterized after delivery, symptoms of cystitis, two weeks after delivery dysuria and straining, something was noticed at meatus by nurse, next day yellow mass was larger. Expelled en masse on 3rd day.
34	O'Neil (Case II)	Difficult forceps delivery. Post-partum retention.	"Large sloughing membrane, size of the palm of the hand."	9 months later, bladder capacity 3 oz. Can hold urine an hour sometimes, at times incontinence.		Patient had to be catheterized for 3 days after delivery, this was followed by symptoms of cystitis and incontinence with foul urine. 3 weeks after delivery sudden retention, a yellow sloughing mass was found protruding from meatus, removed by her physician.

CASES OF EXFOLIATION OCCURRING IN MALES

No.	Name	Cause	Structure of Exfoliated Membranes	Result	Reference.	Remarks.
1	Bosc	Retention.	Thickened mucous membrane found at autopsy almost detached.	Death.	Bull. de la Soc. Anat. de Paris, 1827, Vol. II, p. 84.	72 years old; stricture, perineal fistulæ, intermittent retention, all urine passed by perineum. Three bladder perforations at autopsy.
2	Buchanon	Ch. cystitis, Prostate with infection(?)	Said to have been mucous membrane entire.	Recovery.	Brit. Med. Journal, Nov. 4, 1871, Vol. II, p. 520.	Remarkable in that membrane was passed after great pain per urethra.
3	Jacobi	Urinary symptoms of long duration.	Mucous membrane found at autopsy entirely detached and filled with purulent urine.	Death.	N. Y. Med. Journal, Sept., 1882, p. 304.	66: died with symptoms of septic cystitis. Bladder could not be emptied either with great pain per urethram.
4	Shrady	Retention with extravasation.	So necrotic examination negative.	Perfect recovery.	N. Y. Med. Record, 1884, XXV, p. 79.	Membrane was passed through perineal section wound one month later. Urine had been foul. Dr. Shrady thinks it was an exudate. History, however, and length of time is very suggestive of exfoliation.
5	Clarke	Retention three days.	Partially detached mucous membrane in bladder. Top of bladder had sloughed through. (Autopsy.)	Death.	Trans. Path. Soc., London, 1888, Vol. 39, p. 164.	36 years old. Bladder beyond umbilicus. Catheter passed. Bladder completely paralyzed. Perineal section, death from sepsis.
6	Southam	Retention due to fracture 7th cerv. vert.	Autopsy. A membrane consisting of mucous and submucous coats. Muscular coat was exposed on removal of membrane.	Death.	Med. Chron., Manchester, 1892, XVII, p. 230.	Urine became foul on 4th day in spite of precautions. Death in one month.
7	Fenwick	Bladder symptoms 25 years. No prostate, no stricture. Bacterial cystitis(?)	Mucous membrane with muscular fibers on outside. (Perineal operation.)	Recovery. Urinations ev. 1½ hrs.	Tr. Med. Soc., London, 1893-4, XVII, p. 346.	Condition was found by exploratory perineal section for purulent cystitis.

8	Stein	Probable cause lithiasis and infection.	Portions of mucous and sub mucous coats had been passed by urethra.	Death.	Journal Cut. and G. U. Diseases, N. Y., 1894, XII, p. 273.	No autopsy. Patient had had renal and vesical calculus.
9	Dean	Retention two days, impacted uretheral calculus.	Mucous, sub-mucous and muscular coats found at suprapubic operation.	Recovery. Capacity 5 ounces.	Practitioner, London, 1904, LXXII, p. 907.	Stone removed from urethra, difficulty of emptying bladder continued for several days even with catheter. Patient passed on 3rd day 95 oz. urine. Later showed signs of sepsis, 18 days after retention, suprapubic operation, complete cast of bladder removed.
10	Esau	Post operative retention. (Lap. for stenosis of pylorus in a prostatic). Cystitis lighted up by use of catheter.	So necrotic elements not made out. Cast of bladder including trigone and portion of one ureter removed by suprapubic operation.	Recovery. Bladder capacity 100 c. c.	Folia Urologica, 1907, I, 582.	Difficulty of mic. before operation. Catheterized six days later, violent pain and tenesmus, urine foul. Constant drainage attempted, catheter continually being blocked by dirty grey looking tissue, on removing catheter piece of tissue found adherent. Ineffectual and painful attempts to empty over-distended bladder. Suprapubic cystotomy (lumbar anesthesia) Necrotic cast of bladder removed.
11	Dolbeau	Vesical Calculus.	Fragment size 5 franc piece containing muscle fibers.	Recovery.	Tr. Prac. de la pierre dans la vessie, p. 309, 1864.	26 days after operation passed a membrane incrusted on one side. 39 days after operation almost all urine passed by perineum.
12	Deschamps (Quoted by Dolbeau)	Vesical Calculus.	"Considerable portion of internal lining of bladder."	Recovery with considerable loss of control.	Tr. Prac. de la dans la vessie, p. 312.	Stone was a large one. Urine became foul. Membrane was passed 37 days after operation. (By perineum?)
13	Falkenberg	Retention with extravasation.	Membrane "looked like bladder."	Recovery. Perineal fistula, capacity 3 oz.	Trans. Surg. Soc., Moscow, 1890, Vol. 9, Book 5, p. 378.	Retention with sloughing of tissues of perineum, this area was drained and appeared to connect with the bladder, pus and foul urine obtained. On 19th day membrane was passed. No pathological examination, but probably true case.

No.	Name	Cause	Structure of Exfoliated Membranes	Result	Reference.	Remarks.
14	Margulies	Retention? Infection. "Blood vessels of sub-mucous coat filled with lime salts. Probably of secondary origin."	Mucous, sub-mucous and muscular coats. Removed at suprapubic operation.	Complete recovery.	Khirurgia, Moscow, 1904, Vol. XV, p. 158.	Patient went to bed well, awoke with tremendous desire to micturate, unable to do so at first, later passed urine and blood, after which tenesmus and passage of blood every few minutes, this continued 24 hours. After 6 days entered hospital gradually improved. 8th day after admission a second similar attack and in six days more, a third. Urine had become foul with cadaveric odor. Intense cystitis, catheterization unsuccessful. Suprapubic operation. (This case is very completely reported, see text.)
15	Specimen No. 4968 Warren Museum		Autopsy—bladder wall thickened and trabeculated mucous membrane, hemorrhagic and gangrenous. On left is a large diverticulum containing a slough of its entire mucous membrane.	Death.	Warren Museum, Harvard Med. School.	Patient 35 years of age, had had a foul cystitis for 6 mos. Urine, blood, pus and gangrenous detritus. Suprapubic operation for drainage. Death in a few hours.
16	Tronchet	Retention in a diabetic.	Bladder enlarged, color dark ,tissue friable. Surface covered with a soft gangrenous looking membrane. (Autopsy.)	Death.	Med. Journal Bordeaux, No. 23, 1884.	Man 75; polyuria, sugar present. Patient had stricture which contracted. Retention, difficulty in passing any instrument. In 6 days condition became grave.

17	Pepin	Retention due to traumatic rupture of urethra.	Fragments of membrane containing submucosa and part of muscularis. Bladder gangrenous with several perforations. Adhesions to abdominal wall, omentum and intestines. (Autopsy.)	Death.	Thesis, Paris, 1893.	Man 57; traumatic rupture of the urethra, hematuria and difficult micturition, followed by retention and perineal urinary abscess. This was opened, one litre of foul urine, retention continued catheterization difficult, stream was continually blocked. Abdominal wall shows signs of infection. 48 days after injury and a month after opening abscess suprapubic operation was done; abdominal wall gangrenous, large pieces of membrane were washed out. Death in a week.
18	Hagner	Enormous retention in a prostatic infection.	Large fragments of gangrenous mucous membrane passed after perineal section.	Recovery.	Read at the meeting of the Am. Urological Association, Atlantic City, June, 1909. Am. Urolog. Assoc. Trans., 1909.	Male, 72; 5 years of urinary difficulty. Dribbling became constant. Acute retention relieved after 36 hours, 4 quarts urine drawn. In 24 hours, a second retention, this time urine foul. One week after 1st retention perineal section under cocaine; one week later perineal prostatectomy. Final recovery.

TABLE OF CASES OF NECROSIS OF THE BLADDER

COLLECTED BY DR. F. W. N. HAULTAIN

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Cases of Necrosis without Exfoliation.

No.	Name.	Cause of Death.	Reference.
1	Dray.	Peritonitis.	Med. and Phys. Journal, 1860, p. 456.
2	Haultain.	Uræmia.	Case II. Lab. Ref. Royal Col. of Phys. Edin., 1890. Vol. II, p. 216.
3	Bamberger.	Uræmia. (?)	Thesis (prix Capuron), by Elleaume, Paris, 1860, p. 64.
		Necrosis of Bladder with Perforation.	
4	Van Doeveren.	Perforation on 23rd day.	Observat. Acad. Groningæ, 1765, p. 83.
5	Hunter.	do 6th day.	Med. Observat. and Enquiries, 1771, Vol. IV, p. 58.
6	Lynne.	do 15th day.	Med. Observat. and Enquiries, 1771, Vol. IV, p. 388.
7	Naumburg.	do 28th day.	Stark's Archiv., 1796, Vol. VI, p. 381.
8	Saxtorph.	do 21st day.	Gesammelte Abhandlungen, 1802, Vol. I, p. 261.
9	Moreau.	do 50th day.	Archiv. für Gynaeklogie, Bd. XVI, p. 341.
10	Litzmann.	do 50th day.	Archiv. für Gynaekologie, Bd. XVI, p. 341.
11	Southey.	do 18th day.	Lancet, 1871, Vol. I, p. 610.
12	Schwarz.	do 37th day.	Centralblatt für Gynaekologie, 1880, Vol. VI.
13	Craninx.	do in about 1 mo.	Traité pratique des Accouchements, 1838, p. 230.
14	Valenta.	do 15th day.	Memorabilien, 1883.
		Cases of Necrosis with Exfoliation.	
15	Tulpius.	Recovery.	Observ. Medicæ, Lugduni Batavorum, 1716.
16	Martyn.	Recovery.	Path. Trans., London, 1863, Vol. XV, p. 137.
17	Wells.	Death.	Path. Trans., London, 1863, Vol. XV, p. 140.
18	Wells.	Recovery.	Path. Trans., London, 1863, Vol. XV, p. 140.
19	Whitehead.	Recovery.	Brit. Med. Jour., Vol. II, 1871, p. 432.
20	Godson.	Recovery.	Brit. Med. Jour., Vol. II, 1871, p. 432.
21	Barnes.	Recovery.	Med. Times, Vol. I, 1861, p. 186.
22	Phillips.	Recovery.	Brit. Med. Jour., 1871.
23	Wardell.	Recovery.	Brit. Med. Jour., 1871.
24	Schatz.	Death.	Archiv. für Gynaekologie, Vol. I, p. 469.
25	Moldenhauer.	Death.	Archiv. für Gynaekologie, Vol. VI, p. 108.
*26	Frankenhauser	Recovery.	Archiv. für Gynaekologie, Vol. VI, p. 77.
27	Luschka.	Death.	Virchow's Archiv., 1854, p. 30.
28	Brandeis.	Recovery.	Archiv. für Gynaekologie, Vol. VII.
29	Bell.	Recovery.	Edin. Med. Jour., 1875.
30	Maunder.	Recovery.	Med. Times and Gazette, Vol. II, 1863, p. 522.
31	Zeitfuchs.	Recovery.	Siebold's J., Geburtshülfe, 1833.
32	Wittich.	Recovery.	Neue Zeitschrift für Geburt, Vol. XXIII, p. 98, 1847.

* This case is reported again, together with another case (the writer's Table, No. 18) by Ribnikar in an Inaugural Dissertation, Zurich, 1882. It is remarkable in that the exfoliated membrane showed the presence of peritoneum.

No.	Name.	Result.	Reference
33	Haussmann.	Recovery.	Monatschrift für Geburt, 1868, Vol. XXXI, p. 132.
34	Madurowicz.	Recovery.	Wiener Med. Wochenschrift, 1877, Nos. 2 and 3.
35	Hurry.	Recovery.	Edin. Med. Jour., 1884, p. 1000.
36	Hewitt.	Recovery.	Obstet. Trans., 1883.
37	Aveling.	Recovery.	Obstet. Trans., London, 1883.
38	Pinard.	Death.	Annales de Gynécol. et d'Obstét., 1886.
39	Boldt.	Death.	Am. Jour. of Obstetrics, 1888.
40	Haultain.	Recovery.	Lab. Reports Royal Col. of Phys. Edinburgh, 1890, Vol. II, p. 216.
41	Walters.	Recovery.	Obstet. Trans.
42	Baynham.	Recovery.	Edin. Med. and Surg. Jour., 1830, Vol. XXXIII, p. 156.
43	Lever.	Recovery.	Guy's Hospital Rep., 1852.
44	University College Spec.	Recovery.	Museum University College Spec., 1466.
45	Mauer.	Recovery.	Thesis, Berlin, 1881.
46	Doran.	Recovery.	Obstet. Trans., London, 1881.
47	Ritter.	Recovery.	Vierteljahrschrift für Heilkunde, Prague, 1844, p. 37.
48	Kleim.	Death.	Inaugural Dissertation, Berlin, 1880.
49	Lemaire.	Death.	Bull. Soc. Anatomique, 1863, p. 416.
50	Dubard.	Death.	Bull. Soc. Anatomique, 1877, p. 291.
51	Rosenplanter.	Recovery.	Inaug. Dissertation, Dorpat, 1856.
52	May.	Death.	Inaug. Dissertation, Giessen, 1862.
		With Exfoliation and Perforation.	
53	Krukenberg.	Death.	Archiv. für Gnyaekologie, 1882, Vol. XIX.
		Necrosis of Bladder with Exfoliation in Males.	
54	Lee.	Death.	Path. Trans., Vol. XV, p. 136.
55	Wilks.	Death.	Path. Trans., London, Vol. XV, p. 138, 1863.
56	Liston.	Death.	Spec. 1933, Surgeons' Museum, London.